ENGINEERING NEWS-RECORD

NOVEMBER 5, 1942

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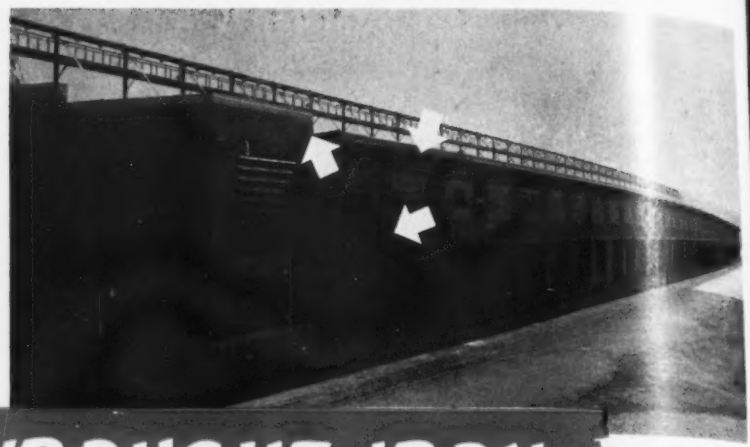
An **Added** Safety-Factor in Waterfront Construction Here



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As everyone who has had experience with metals in such applications knows, wrought iron is particularly well adapted to meet the severe corrosive conditions encountered, and has been widely used. As one example—a New Jersey manufacturing concern used wrought iron sheet in 1907 to roof and side a mill building. After 20 years two new buildings were projected, and because the wrought iron sheets were still in excellent condition, wrought iron was again specified. The president wrote, "In contrast to our experience with wrought iron we have had some very unfortunate experience with other types of metals. We have, from time to time, bought small quantities of sheets in a hurry, and been unable to get wrought iron on such short notice. These sheets of a less durable metal have corroded badly in as short a time as three years and had to be replaced."

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Vol. 129 NOVEMBER 5, 1942 No. 19

COMING NEXT

• Modern methods of building underwater are described in an article on construction of two exceptionally large drydocks at an eastern navy yard. Intended for construction of large naval vessels on an even keel, and without the attendant difficulties of launching from ways, these docks presented some unusual construction problems. Deep excavation, subaqueous pile driving, form setting underwater and placing of 500,000 cu.yd. of tremie concrete are highlights covered in this story.

• How the city of Philadelphia is using glass-beaded paint to solve the problem of street and curb markings for traffic control under blackout conditions is an interesting wartime experiment. The methods used will be of special interest to street and highway engineers.

• The merits of welded, rigid-frame design over conventional truss construction, as a means of effecting steel economies and reducing cost for single-story industrial buildings, is discussed by F. W. Mettler, consulting structural engineer of Cleveland.

LOOKING AHEAD

• One of the most interesting and difficult engineering feats accomplished since Pearl Harbor was the recent dismantling of two immense steel blast furnaces in Illinois. The problem not only involved the dismantling but also inspection, reconditioning, shipping and reassembling of thousands of items. One complete furnace was transferred to Utah for rebuilding at a steel plant and the other was sent to Minnesota and rebuilt. Procedure in handling this job will be described in *ENR* Dec. 3.

• Bridge painting on the California highway system has become an art. For twelve years special crews have been assigned exclusively to this work, thus the operators have become specialists in their field. Many improvements in methods, equipment and materials have been developed. This phase of bridge maintenance will be the subject of an interesting article in an early issue.

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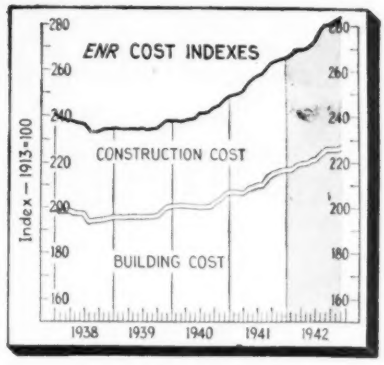
MONTHLY CONSTRUCTION BUSINESS SUMMARY

ENR CONSTRUCTION VOLUME AND NEW CAPITAL . . . . F H A MORTGAGES

(,000 omitted)	October 1941	October 1942	% Change	Ten Months 1941	Ten Months 1942	% Change
Total Construction	$406,332	$691,979	+70.0	$5,250,210	$8,324,585	+59.0
Private Construction	94,760	37,041	−61.0	1,061,698	511,781	−52.0
Public Construction	311,572	654,938	+110.0	4,188,512	7,812,804	+87.0
Federal	200,358	617,704	+208.0	3,111,447	7,335,981	+136.0
Total New Productive Capital	$228,329	$25,297	−89.0	$6,089,206	$9,555,998	+57.0
Private Investment	50,999	24,297	−52.0	707,098	375,945	−47.0
Federal (non-federal work)	177,330	1,000	−99.0	555,990	213,155	−62.0
Federal (federal work)	.....	.....	.....	4,826,118	8,966,898	+86.0
FHA Mortgages Selected for Appraisal (Title II)	$97,415	.....	.....	$1,221,482	.....	.....
(Title VI)	16,568	.....	.....	141,980	.....	.....



CONSTRUCTION COSTS . . . . WAGE RATES . . . . PRICES

	November 1941	November 1942	% Change	Change October to November 1941 Oct.	1941 Nov.	1941 %	1942 Oct.	1942 Nov.	1942 %
E N R Construction Cost Index, 1913 = 100‡	266.13	283.64	+6.6	264.46	266.13	+0.6	282.44	283.64	+0.4
E N R Building Cost Index, 1913 = 100‡	216.54	226.58	+4.6	215.92	216.54	+0.3	225.90	226.58	+0.3

‡Does not reflect increased costs due to more overtime, lower labor efficiency, delivery delays, etc.

ENR 20-CITIES' AVERAGE

	November 1941	November 1942	% Change	Change October to November 1941 Oct.	1941 Nov.	1941 %	1942 Oct.	1942 Nov.	1942 %
Common Labor	$0.768	$0.832	+8.3	$0.761	$0.768	+0.9	$0.826	$0.832	+0.7
Skilled Labor (Av. 3 trades)	1.521	1.599	+5.1	1.516	1.521	+0.3	1.589	1.599	+0.6
Bricklayers	1.614	1.693	+4.9	1.608	1.614	+0.4	1.687	1.693	+0.4
Structural Ironworkers	1.588	1.661	+4.6	1.582	1.588	+0.4	1.644	1.661	+1.0
Carpenters	1.362	1.442	+5.9	1.358	1.362	+0.3	1.435	1.442	+0.5
Cement, per bbl.	$2.54	$2.60	+2.4	$2.52	$2.54	+0.8	$2.60	$2.60	0
Reinforcing steel, per cwt.	2.60	2.72	+4.6	2.59	2.60	+0.4	2.72	2.72	0
Struct. steel shapes, base	2.10	2.10	0	2.10	2.10	0	2.10	2.10	0
Sand, per ton	1.19	1.21	+1.7	1.18	1.19	+0.8	1.19	1.21	+1.7
Lumber, 2x4 Fir, per M ft.	46.86	51.55	+10.2	46.47	46.86	+0.8	51.55	51.55	0
Lumber, 2x4 Pine, per M ft.	40.82	44.24	+8.4	40.71	40.82	+0.3	44.24	44.24	0
Brick, common, per M	15.16	15.66	+3.3	14.91	15.16	+1.7	15.58	15.66	+0.5
Ready-mixed concrete, c.y.	7.11	7.34	+3.2	7.07	7.11	+0.6	7.34	7.34	0
Struct. clay tile, 3x12x12	76.94	78.47	+2.0	76.69	76.94	+0.3	77.97	78.47	+0.6
Paving asphalt, cars, ton	15.10	14.92	−1.2	14.68	15.10	+2.9	14.92	14.92	0

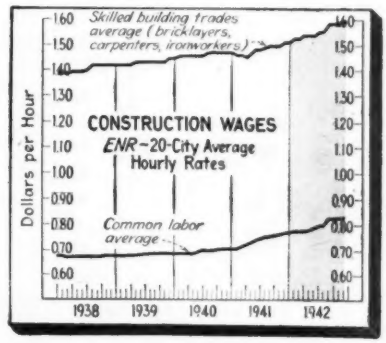
ENR INDEX NUMBERS

Base = 100	Construction Cost 1913	Construction Cost 1926	Building Cost 1913	Building Cost 1926	Volume '13	Volume '26
Nov., 1942	283.64	136.35	226.58	122.48	.....	.....
Oct., 1942	282.44	135.77	225.90	122.11	421	185
Sept., 1942	281.61	135.37	225.46	121.88	544	238
Aug., 1942	281.61	135.37	225.39	121.84	622	273
July, 1942	277.65	133.46	223.45	120.79	736	323
June, 1942	274.19	131.80	221.18	119.56	752	330
May, 1942	272.30	130.89	220.14	119.00	821	360
April, 1942	271.78	130.64	219.55	118.68	569	249
Mar., 1942	269.71	129.65	218.88	118.32	578	253
Feb., 1942	269.41	129.51	218.44	118.08	507	222
Jan., 1942	267.63	128.65	217.12	117.37	402	176
Dec. 1941	266.16	127.94	216.37	116.96	217	95
Nov., 1941	266.13	127.93	216.54	117.05	282	124
Oct., 1941	264.46	127.13	215.92	116.72	263	115
1941 (Av.)	257.84	123.95	211.46	114.32	375	164
1940 (Av.)	241.96	116.31	202.81	109.64	269	118
1939 (Av.)	235.51	113.21	197.44	106.73	211	92
1938 (Av.)	235.86	113.34	196.83	106.40	197	86

MATERIAL SHIPMENTS . . . . BUILDING PERMITS

	October 1941	October 1942	% Change	Sept. 1942	% Change Sept.-Oct.
Lumber (% 1935–'39 wk. seas. av.) N. L. M. A.	142.3	133.5	−6.2	132.0	+1.1
Steel (% operating capacity) A. I. S. I.	98.6	100.2	+1.6	96.8	+3.5

	September 1941	September 1942	% Change	Nine Months 1941	Nine Months 1942	% Change
Fabricated Structural Steel, tons, A.I.S.C.	204,085	164,561	−19.4	1,674,632	1,591,826	−5.0
Cement, thous. bbl., U.S.B. of M.	18,284	20,150	+10.2	124,440	141,277	+13.6
Building Permits, Dun & Bradstreet, (,000 omitted)	$119,412	$56,254	−52.9	$1,152,389	$679,116	−41.1



COST OF LIVING INDEXES . . . . EMPLOYMENT

	September 1941	September 1942	% Change	Aug. 1942	% Change Aug.-Sept.
Cost of Living Index, N.I.C.B.	90.8	98.6	+8.6	98.1	+0.5
Rent (Housing) Index, N.I.C.B.	88.9	90.8	+2.1	90.8	0
Total Employment (est.) thous., B.L.S.	36,056	38,302	+6.2	37,802	+1.3
Construction Employment (est.) thous., B.L.S.	2,614	2,215	−15.2	2,379	−6.9

ENGINEERING CONSTRUCTION CONTRACTS——ENGINEERING NEWS-RECORD——OCTOBER, 1942

Engineering News-Record *reports projects of the following minimum costs—waterworks, excavation, drainage and irrigation,* $15,000; *other public works,* $25,000; *industrial buildings,* $40,000; *other buildings,* $150,000

Five Weeks—Thousands of Dollars (000 Omitted)

Public Works	New England	Middle Atlantic	South	Mid West	West of Mississippi	Far West	United States October 1942	United States Ten Months 1942	United States Ten Months 1941	Canada
Waterworks	991	401	4,292	7,609	2,698	945	**16,936**	133,603	68,650	118
Sewerage	246	604	2,251	4,342	1,951	2,872	**12,266**	106,139	74,657	164
Bridges, public	55	1,681	127	482	324	902	**3,571**	47,647	95,703	37
Earthwork and waterways	328	50	765	124	4,404	4,216	**9,887**	245,416	230,615	195
Streets and roads	609	6,714	11,749	15,954	14,675	9,350	**59,051**	490,548	519,654	5,352
Buildings, public	8,205	83,905	73,265	47,204	75,445	69,135	**357,159**	5,098,529	2,461,873	12,168
Unclassified, public	3,592	16,052	33,138	59,464	58,544	25,278	**196,068**	1,690,922	737,360	9,133
Total public	**14,026**	**109,407**	**125,587**	**135,179**	**158,041**	**112,698**	**654,938**	**7,812,804**	**4,188,512**	**27,167**
Federal government (included in above classifications)	13,275	102,153	118,006	124,659	154,842	104,769	**617,704**	7,335,981	3,111,447	.....
Private										
Bridges, private	.....	.....	.....	.....	.....	.....	.....	890	5,762	.....
Industrial buildings	957	2,485	512	2,030	3,395	899	**10,278**	188,028	453,967	2,207
Commercial buildings	4,650	3,435	800	3,590	.....	8,766	**21,241**	264,629	425,412	.....
Unclassified, private	310	310	3,253	25	995	629	**5,522**	58,234	176,557	35
Total private	**5,917**	**6,230**	**4,565**	**5,645**	**4,390**	**10,294**	**37,041**	**511,781**	**1,061,698**	**2,242**
Total Engineering Construction:										
October, 1942 — 5 weeks	**19,943**	**115,637**	**130,152**	**140,824**	**162,431**	**122,992**	**691,979**	.....	.....	**29,409**
September, 1942 — 4 weeks	110,025	85,400	137,644	86,723	179,542	113,375	**712,709**	.....	.....	19,943
October, 1941 — 5 weeks	16,581	123,634	68,422	54,339	60,424	82,932	**406,332**	.....	.....	23,558
Ten Months — 1942	**416,785**	**1,092,218**	**1,672,875**	**1,442,956**	**2,254,468**	**1,445,283**	.....	**8,324,585**	.....	**200,627**
Ten Months — 1941	268,488	1,069,577	1,157,563	779,168	1,228,971	746,443	.....	.....	5,250,210	232,615

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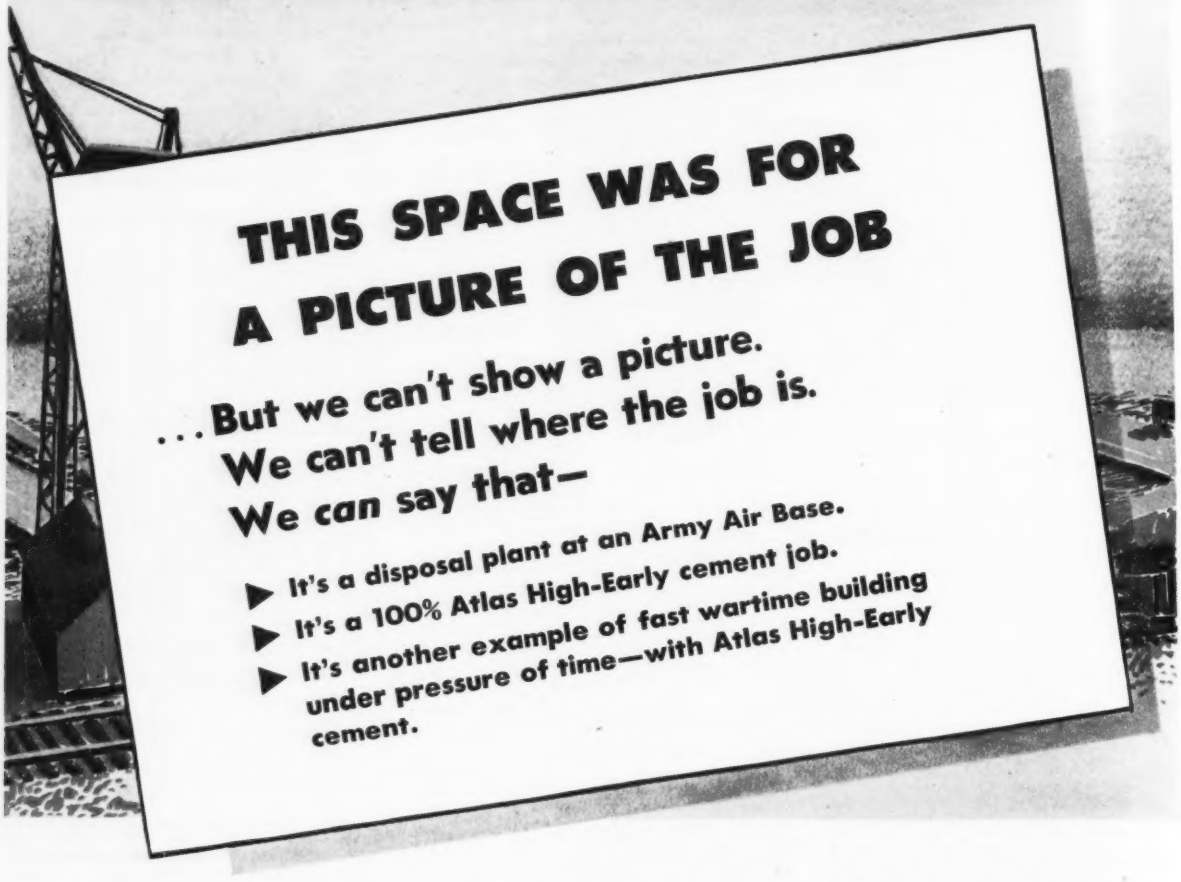
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ENR-H-47

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The Week In Engineering and Construction

ENGINEERING NEWS-RECORD • NOVEMBER 5, 1942 • VOLUME 129 • NUMBER 19

Place construction industry under price regulation

Existing contracts not affected by final form of long-pending order, and Army and Navy contracts are excluded from provisions. Some procedure simplified.

Prices charged in all construction contracts entered into with civilians after Nov. 5 must be limited by the Office of Price Administration's Price Regulation 251—"Construction and Maintenance Services and Sales of Building and Industrial Equipment and Materials on an Installed Basis."

Theoretically, the construction industry has been under price control since last March, when the General Maximum Price Regulation froze all prices at March levels. General Maximum, however, is so obviously inapplicable to construction that it has been generally disregarded, both by OPA and industry. For nearly five months (*ENR*, June 18, p. 57) OPA has been working on the preparation of a price regulation specifically applying to construction. This is it.

The regulation does not cover prime or sub-contracts of the Army or Navy. Nor does it cover work outside the continental U. S.

In its final form, Regulation 251 has two important changes from the tentative order shown to the industry seven weeks ago (*ENR*, Sept. 17, p. 10). Contracts entered into before Nov. 5 are not subject to the terms of the regulation. And a simplified formula for computing the ceiling price on a lump sum contract has been introduced, designed to overcome the fear, expressed in *ENR* editorial pages Sept. 24, that the regulation would make competitive bidding impossible.

Other changes include introduction of a clause explicitly forbidding payment of bonuses to contractors for rapid performance or any other consideration, without OPA approval. Also new is a simple, if somewhat vague, procedure for pricing contracts under $500. Ceiling on such contracts is the price which would have been charged for the same work in March, plus increases in labor cost between March and July 1.

For larger contracts, two pricing formulas are established. One covers cost-plus contracts. The other covers lump-sum and unit-price contracts.

The ceiling price on a cost-plus contract is the sum of: (1) Actual cost of materials and supplies. (2) Labor cost figured at rates not exceeding those in effect July 1 "in the area of installation." (3) Other direct costs, such as equipment rental, insurance, travel, etc. (4) A margin to cover overhead and profit. This margin, in terms of percentage of total cost, may not exceed the highest margin received by the contractor on comparable work between Jan. 1, 1939 and March 31, 1942. If the contractor did no comparable work during this period, the margin shall be the amount he would have charged last March, based on his "own general experience and the experiences of the industry on such comparable sales."

Item 2 in the above formula—labor cost—is likely to prove the most significant feature of the regulation. Most construction wage rates are now frozen at July 1 levels, as regards federal work, by an agreement between the AFL building trades department and federal construction agencies (*ENR*, May 28, p. 879). Effect of regulation 251 is to extend the freeze to all construction, by making it impossible for the contractor to pay higher rates unless he is willing to take them out of his own profit.

Within ten days after entering into any cost-plus contract, the contractor must file with the nearest OPA office a description of the job, a statement of the estimated costs, a statement of the percentage margin or flat fee proposed to be charged, and "an indication" of the overhead items included in the margin.

For lump-sum or unit-price contracts, the pricing formula is the same except that estimated instead of actual costs are used. Moreover, the contractor is allowed to charge as a cost "an estimated reserve for such contingencies as the seller in good faith can reasonably forsee."

As originally released last September, the regulation included an elaborate procedure for dealing with any difference between the estimated costs and those actually encountered. The final form abandons this burdensome requirement. Instead, the contractor is required to report to the nearest OPA office within ten days after entering the contract the price he is charging, broken down by estimated values of: materials and supplies, labor, other direct costs including sub-contracts, contingencies, and margin. Then, at least ten days before final settlement under the contract, the contractor must file with the same OPA office a statement of the actual costs, broken down in the same way. Presumably, if too much of a discrepancy showed up between the actual and estimated costs, OPA would be inclined to question the estimates.

Somewhat to ease the burden of the reports required, the regulation permits submission of estimate sheets or other working papers, provided they carry the information wanted.

Approve major increase in Seabee force

The President has authorized an increase in the strength of the Navy's Construction Battalions to 210,000 men—more than twice the size of the entire peace-time naval personnel.

Organized a year ago with an initial force of 99 men (*ENR*, April 2, p. 509), the "Seabees" have proved to be a valuable, alert, and fast growing force. Only two weeks ago, it was announced that a new training center—Camp Peary, Va.—would soon be ready to receive its first recruits (*ENR*, Oct. 22, p. 535).

The original 99-man organization was set up by the Bureau of Yards and Docks to serve as a field inspection force on civilian contract projects. This force was formalized into the present Construction Battalions shortly after Pearl Harbor.

The first Seabee contingent completed training and left the United States early in January, setting out for a still-unidentified Pacific base, where the Navy reports that they have achieved a normal year-and-a-half's work in a few months. Primarily concerned with construction activities, the organization's personnel is trained in the use of all weapons, and travels fully equipped to protect its work from any sort of attack. (*ENR*, Sept. 24, p. 415).

Sanitation and water emergency needs outlined at annual A.P.H.A. meeting

State and municipal engineers at American Public Health Association conference focus attention on administrative problems created by war and hear of new WPB water supply program

With full appreciation that the kaleidiscopic nature of the war effort called for frank discussion of mutual problems, state and municipal sanitary engineers, U. S. Public Health Service delegates and War Production Board representatives questioned each other at morning, afternoon and night sessions held in conjunction with The American Public Health Association meeting in St. Louis on Oct. 24–29.

Among the major accomplishments of the conference was a clarification of procedures under the Lanham Act emergency sanitation program and an explanation of a new WPB program for water supply by which it is hoped critical shortages in both water supply and materials can be avoided.

Washington is slow

Principal concern voiced by the state sanitary engineers was the slowness in getting action from "Washington" on applications for emergency sanitation projects. An example cited was Mead, Nebr., where the population jumped from 200 to 2,000; an application for federal aid in providing refuse disposal facilities was filed last spring under the Lanham Act provisions. To date no action has been taken, but fortunately for all concerned, the town's population now has dropped to near normal and the need for extra facilities has passed.

Seizing upon this example, Ernest Boyce of the U. S. Public Health Service, said that there were many cases where unusual disruptions of services occurred because of a temporary influx of construction or migrant workers and applications were made immediately for permanent types of enlarged sanitation facilities. Had all of these requests for aid been granted there would be neither money nor materials left for bona-fide needs that now exist.

However, pointed out Ellis Tisdale, also of the USPHS, much improvement has been made in the processing of applications as compared to the "tortuous" route that heretofore had to be traversed. Today, he promised, simplified forms and procedures are being used to expedite all requests.

According to Mr. Boyce the reasons for delay in completing sanitation works were: redesign of original plans in order to eliminate strategic materials; priority restrictions; and lack of engineering and construction facilities. He agreed with charges by the state engineers that governmental agencies were profligate in their use of critical materials even after curtailment had been ordered, but, he said, many such projects were now under scrutiny and before long the WPB will take steps to recapture certain materials. The possibility of exhuming pipe installed at certain Army and housing projects was mentioned.

Sanitary engineers underestimated

The Navy was charged with a lack of appreciation of the function and capabilities of the sanitary engineer by Arthur Weston, chief engineer of the Massachusetts state department of health.

While the Army submits plans to the health department on sewage disposal installations, said Mr. Weston, the Navy will not. As a result, inadequate facilities may be provided. In one case, a small septic tank was installed at a Navy establishment; some weeks later when the establishment was enlarged, the tank was simply made bigger with the result that it functioned improperly. If advice had been sought from the health department basic sanitary engineering principles would not have been violated in making enlargements.

Mr. Weston urged also that the design of sewage disposal plants at certain military establishments be simplified. He cited the fact that treatment facilities now undergoing construction—which

Arthur Gorman, chief, water supply section, WPB, who urged city public health officials for a "priority on conscience" in submitting applications for new facilities.

Latin-American sanitation symposium

One of the highlights of the APHA meeting was a symposium on Latin-American sanitation developments arranged by the Pan-American Sanitary Bureau. Some 16 engineers from south of the border who are now on a visit to this country were in the group.

A background picture of sanitation needs and progress was given first by Gordon M. Fair, engineer-consultant to the Coordinator of Inter-American Affairs, who recently returned from a 15,000 mile trip through Central and South America.

Speaking for Panama, Carlos Guardia, sanitary engineer of the Republic, said that overcrowded housing conditions brought about by construction activities on the Panama Canal were creating serious environmental health problems. Unless the United States interests concerned can secure priorities on material it will be difficult to take corrective measures.

Louis Rojas, assistant to Gustava Noguera, chief sanitary engineer of Colombia, said that his country had devised a successful way to raise and allocate money for sanitation. A tax is placed on lotteries, beer, telephones and public entertainment; this provides funds that are allocated to each municipality on the basis of population. On major municipal public works the national government provides 60 percent, the state 30 percent and the local government 10 percent. The federal grant is used to purchase all materials; centralized buying is done in Colombia, the national authorities purchasing everything that is needed by local government units.

Peru has all the natural resources for a complete economy, said Luis Mantilla, chief sanitary engineer, but these are of little value until a healthful environment is created. Progress is being made to this end with the aid of the Pan-American Sanitary Bureau, Rockefeller Foundation and Coordinator of Inter-American Affairs.

In Bolivia, much work needs to be done, according to Julio Jaurery, chief sanitary engineer. In the rubber-producing area alone, more than 50 percent of the available labor is always ill with malaria.

Chile has been making good progress said L. Caballero, sanitary engineer. Water supplies serving 50 percent of the population are controlled, and 36 percent of the people are served by sewerage facilities. A $20,000,000 water supply program for 100 towns is planned; it will be financed through property taxes.

Angel Balcarel told of mosquito control measures in Guatemala designed to reduce a malaria death rate of 20 percent of the population.

were in order prior to Pearl Harbor—cannot be completed now because of the lack of materials. The result is that no treatment can be provided. A simpler, less efficient plant that works is better than a monumental array of tanks and equipment that cannot be used.

Plain talk on waterworks

Abel Wolman and Arthur Gorman, consultant and chief, respectively, of the water supply section, WPB, made a plea for the cooperation of state and municipal engineers in conserving waterworks materials.

Abel Wolman

"The WPB," said Mr. Wolman, "finally realized last July that water is one of our most critical resources. Many mistakes were made in the allocation of materials, and this led to the creation of a section in WPB to deal solely with development and creation of new supplies."

He outlined a three-point program that is to be instituted by WPB. This includes:

1) Making an immediate decision concerning the extension of facilities in some 200 areas in order that the most important projects can be started.

2) Establishment of the Mutual Aid Plan on a regional basis coinciding with the OCD regional setup. This will eliminate the previous, voluntary state unit organization; and

3) Initiation of a survey to determine accurately what "fat" exists in the inventory of supplies now held by waterworks. This excess inventory must be determined so that WPB can make proper allocations of supplies and materials to individual waterworks and to manufacturers.

Arthur Gorman discussed each of these proposals in detail, stating that water supplies would be put to a critical test beginning next March when war production plants reach their maximum rate of output. He urged state engineers to carefully evaluate the merits of every application for waterworks aid emanating from their areas.

"A check and double-check must be made," he said, "because there isn't enough material to go around. I plead with you to establish a priority on conscience."

Demand for sanitary engineers

So great have been the demands for sanitary engineers in the war period that there are virtually none available for the even greater demands that are being made now by the Army, U. S. Public Health Service and states, said Gordon M. Fair, of Harvard University and a member of a joint committee with the Am. Soc. C. E. on the advancement of sanitary engineering.

Making a final report on the committee's work, which was finished some time ago, (see *Civil Engineering*, June, 1942), Professor Fair said that the recommendations already were out-of-date because peacetime needs (to which the committee addressed itself) have been outstripped by war demands.

He raised the question of creating within the Manpower Commission an office of "procurement and assignment" for sanitary engineers, which not only would reassign trained men to sanitary work by taking them out of fields of service in which they happen now to be engaged, but also would provide training for new men in basic sanitary work.

C. W. Klassen, state sanitary engineer of Illinois, discussed the present status of stream pollution abatement.

Mid-West "Dust Bowl" vanishes in rain

Areas in the Mid-West that were labeled the "Dust Bowl" during the drought of the 1930's, experienced a total runoff for the past two years that averaged 200 to 300 percent of normal, according to the annual Water Resources Review released by the U. S. Geological Survey.

The past 12 month period has been the second consecutive year of reversed conditions as between the Central West and East, the report said. "The water year 1942 was decidedly upside down," it stated, "with 350,000 sq.mi. in the eastern states having a runoff of only 69 percent of normal (sixth driest year in 30 years), whereas in the Mid-West, 625,000 sq.mi. had an average runoff of 240 percent of normal, and for that area as a whole it was the wettest year on record by a very considerable margin.

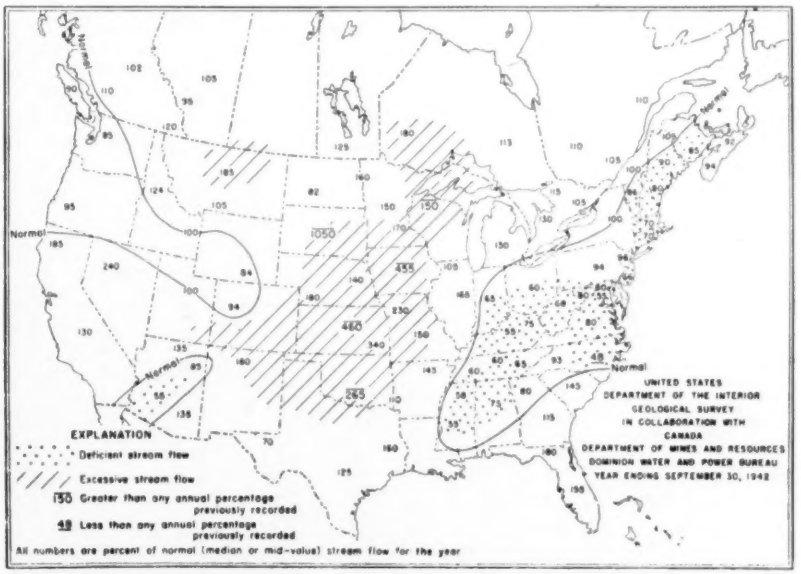
Although the drought persisted in the East throughout the greater part of the year, and the runoff for the year averaged below normal, copious and well timed rains during the late summer and early fall produced normal or above normal stages in the rivers, and caused considerable groundwater recharge. More storage water was available for power and municipal use in the East than on September 30, 1941.

Artificial storage was generally well maintained and generally favorable groundwater conditions prevailed over the United States.

Annual flow of four major continental rivers showed: the Mississippi river, averaging 597,000 cfs at Vicksburg, Miss., 120 percent of normal; St. Lawrence river, at Ogdensburg, N. Y., 214,000 cfs, 99 percent of normal; Columbia river at The Dalles, Ore., 178,600 cfs, 90 percent of normal; Colorado river, at Grand Canyon, Ariz., 23,900 cfs, 135 percent.

There were 35 notable floods reported during the 12-month period, of which those in July, August and September were most outstanding. Floods in the central West, from Minnesota to Oklahoma, were the greatest in area of extent, and many new flood records were set. Also of broad extent were the floods of May which covered an area reaching from southeast British Columbia across Montana, North Dakota to southwestern Wisconsin. Otherwise, floods were local in coverage and marked by intensity of rain and rate of discharge rather than area of extent.

Perhaps the outstanding flood of the year was that of July 17-18 in northwestern Pennsylvania (*ENR*, July 23, 1942, p. 124).


Normal
1050
UNITED STATES
DEPARTMENT OF THE INTERIOR
GEOLOGICAL SURVEY
IN COLLABORATION WITH
CANADA
DEPARTMENT OF MINES AND RESOURCES
DOMINION WATER AND POWER BUREAU
YEAR ENDING SEPTEMBER 30, 1942
EXPLANATION
Deficient stream flow
Excessive stream flow
150 Greater than any annual percentage previously recorded
48 Less than any annual percentage previously recorded
All numbers are percent of normal (median or mid-value) stream flow for the year

American Society of Civil Engineers marks ninetieth year of organization

Long history shows growth from original twelve members to present strength. Many changes in functions and purposes noted

Ninety years ago—Nov. 5, 1852—the American Society of Civil Engineers and Architects was organized in New York City. Twelve men attended that meeting, and a roster of charter members prepared at a somewhat later date gave the total as 55.

Difficult days were ahead, the society held meetings for something over a year and then became inactive until after the Civil War. In the fall of 1867, James Laurie, who had served as president since the society was organized, issued a new call for activity. Permanent headquarters were established and the membership was increased to about double the original number. The following year the name American Society of Civil Engineers was formally adopted.

The first reference to the society in *Engineering News* is found in the issue of July 15, 1875, about 15 months after this journal had been established. In that year the society held its seventh annual convention in Pittsburgh, Pa. It then had 450 members.

Expansion begins

By the time the twenty-fifth anniversary came around, the society had a membership of about 600. No report of the twenty-fifth annual meeting of Nov. 7, 1877, was published in *Engineering News*, but in concurrent issues this journal published the constitution and by-laws of the society "to attract attention to this organization which includes in its membership much of the ablest engineering talent of the country and has proved itself invaluable to the profession at large for its published papers and discussion, as well as for its potent influence on public sentiment and legislation."

Quite different views of the function of such a society were expressed in the same year by *Engineering and Mining Journal*. Sometime previously the members rejected by a decisive majority a resolution to set up a committee to draft a law providing for inspection by experts of all "questionable bridges now in existence." Opponents of the resolution argued that the society "as a body is not competent to set forth opinions on any special points of practice. It is not an association of bridge experts alone, nor is a majority of its members qualified to sit in judgment on the questions involved in bridge construction." In congratulating the society on this action, the editors of *Engineering and Mining Journal* said that such a society should not take action on anything outside of its own special business—"that of holding meetings, and reading and hearing, printing and discussing professional papers."

Type of members

In 1877 the society had the following membership grades: honorary, member, associate and junior. There also were corresponding members who were men not resident of this country but who were eminent in a special branch of engineering, and fellows, who were contributors to the funds of the society. Membership qualifications then were lower than now, seven years of active practice being required for member grade and one year of responsible charge of engineering work which was characterized as being something other than "as a skilful workman merely."

In 1902, when the 50th anniversary was reached, the membership was just a little over 2,500, but a sharp increase already had begun and by the time of the 75th anniversary in 1927, the total membership, exclusive of students, was about 13,000. The first student chapter was organized in 1920. Since 1927 membership has continued to grow, except for a short decline in the early 30's, and now totals about 17,500, exclusive of over 4,500 students.

Press Assn. Photo

Tacoma bridge scrapped

All that remains of the Tacoma Narrows Bridge at Tacoma, Wash., is shown in this unique photograph, as workmen engaged in dismantling the heavy steel cables walk toward their jobs. Steel salvaged will go into the nation's scrap pile.

WPB cuts use of copper building materials

Installation of copper in buildings has been reduced virtually to zero with the issuance of an amendment to the War Production Board's supplementary conservation order M-9-c-4.

In order to prevent the leakage of small amounts of copper that had previously been permitted to be used for building maintenance, and to channel all copper and copper base alloy building products into remelting for war use, the amendment continues to restrict the use of copper building products for repairs to 25 lb. or less, and permits these small amounts to be used only when they were in the possession of the user as of Oct. 27.

With sales to users prohibited, the order provides that deliveries of such materials may be made only to scrap dealers, brass mills or government agencies, particularly Copper Recovery Corporation.

Users formerly could purchase metal for such installations. The effect of the amendment is to prevent the purchase, sale, delivery and use of any copper for installation in buildings so that stocks in the hands of hardware stores, chain stores, warehouses, dealers, contractors and others may be acquired by the government for war use. Another effect is that, except with the specific authorization of WPB, thousands of tons of building products already fabricated, can be sold only to persons whose operations are controlled so as to convert the metal at once into usable war copper and bronze. The amendment adds to prohibited uses screws, nuts, bolts, rivets, shear rings, tierods and washers. The order previously restricted use of copper items to buildings alone. As amended, it extends the prohibition to water systems outside buildings, installations in cooling towers and water towers.

• • •

Marshall Ford Dam gates opened for first time

Gates in Marshall Ford Dam, (*ENR*, Dec. 11, 1941, p. 840), spanning the Colorado river above Austin, Tex., were opened for the first time Oct. 21 to check the rise of water in the lake above the dam above maximum operating level.

Recent rainfall in the Colorado watershed raised the lake level approximately 6 ft. to an elevation which had been set as maximum operating level in agreements between the Lower Colorado River Authority, operators of the flood control system and the U. S. Bureau of Reclamation, which built the dam.

When the water level reached maximum, the gates were opened, releasing an estimated 52,000,000 gpd.

Free 224,000 tons of steel to extend Texas-Illinois pipeline to East Coast

Addition of 857 miles to biggest oil pipeline to be completed in June, insures direct delivery of 300,000 bbls. daily to refineries

Extension of the huge 24-in. dia. Texas-Illinois oil pipeline from Norris City, Ill., to the East Coast will begin next month, as the result of allocation of 224,000 tons of necessary steel by the War Production Board.

The 857-mi., $60,000,000, extension will carry the 24-in. steel pipe across Indiana and Ohio to Phoenixville, Pa., from where branch lines will be laid to the Philadelphia and New York areas, and will assure a direct daily pipeline delivery of 300,000 bbls. of crude oil to the Eastern seaboard.

Actual work awaits only the completion of the leg now being laid between Longview, Tex., and Norris City (*ENR*, July 16, p. 76) and the transfer of construction crews to work sites along the route to the East Coast. The 531-mi. Longview-Norris City section is scheduled for completion in December.

Familiarly known as the "big inch", the pipeline will be financed through the Defense Plant Corp., with work supervised by War Emergency Pipeline, Inc., a company organized by the oil industry to construct the original section. When completed, the pipe will be about 1,388 mi. long—said to be the largest ever constructed for the original purpose of transporting petroleum—and will be equipped with 25 pumping stations to force the flow of oil to terminals.

While all pipe in the Texas to Illinois leg is of seamless steel construction, either seamless or electric welded pipe, or both, will be used in the extension. Petroleum Coordinator Harold L. Ickes, in announcing the extension, said that adequate mill capacity is available for either type. He said also that no delays are expected in establishing the route, as right-of-way can be secured, if necessary, under the terms of the Cole Pipeline Act that authorized the President to grant the right of eminent domain for projects necessary to the national defense.

Aerial surveys of the proposed route were completed last year and ground parties already are in the field staking out the exact route to be followed.

The big pipeline deliveries are expected to release numerous ocean-going tankers from the long water hauls from Gulf Coast ports to the New York-Philadelphia area.

Contractors on the original section met at the Little Rock, Ark., office of B. E. Hull, general manager of War Emergency Pipelines, Inc., last week, and completed arrangements for cost-plus-fixed-fee contracts covering major construction of the new section.

The eight contracting firms now building the initial section (*ENR*, July 23, p. 124) will participate in the extension work, which will start about November 15.

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WPB halts New York vehicular tunnel project

All work on the $81,000,000 Brooklyn-Battery vehicular tunnel, which was to link the boroughs of Manhattan and Brooklyn, has been ordered stopped by the War Production Board for the duration.

The board explained that the step was taken to conserve critical materials. The New York City Tunnel Authority, which went into immediate emergency session, announced that an application for exception from the order had been filed.

Michigan centers large force on expressway

Racing against time as the construction season draws to a close, one of the greatest concentrations of men and equipment ever assembled for a road job is engaged on Section 2 of the Detroit Industrial Expressway, according to G. Donald Kennedy, Michigan state highway commissioner.

To open the 11½ mi. stretch to traffic before heavy snows and freezing weather delay paving operations, 250 skilled men, 483 unskilled men, 238 trucks, 40 power shovels and 31 concrete mixers and pavers are working on the road.

Kennedy also announced that Gilmore D. Clarke and Michael Rapuana, New York consulting engineers, have been engaged as consultants in connection with design and preparation of architectural elevations for Section 3 of the same road.

He said that scarcity of critical materials and unfavorable soil conditions would necessitate a depressed, rather than an overhead, highway in the River Rouge portion of the expressway.

Connecting the Willow Run defense industrial area with metropolitan Detroit, the expressway eventually will become part of the proposed Detroit-Chicago interregional expressway.

Acme Newspictures

Moving rapidly eastward toward Norris City, Ill., the 24-in. dia. oil pipeline from Longview, Tex., here is being wrapped before being placed in the ground. The machine shown at right "dopes" the pipe with a tar-like substance, and then wraps the tube with an asbestos-paper covering.

Many projects halted as WPB pushes its plan to cut 1943 construction volume

Broad standards of war agency's program emerge as priority axe is applied to miscellaneous public works projects throughout nation. Big projects of Reclamation Bureau affected.

The broad standards that the War Production Board is applying in its efforts to hack next year's construction volume to something like eight billion dollars (*ENR*, Oct. 29, p. 597) are gradually becoming evident as cancellations are announced.

The run of miscellaneous public works projects without an extremely immediate connection with the war program are being shut down wholesale, as was evidenced in last week's announcement of the cancellation of more than a hundred road and hospital jobs.

A substantial number of large projects that have been allowed to proceed with low or no priority assistance have now been ordered to shut down entirely. One example of this is the Brooklyn-Battery Tunnel in New York City, which has been going forward on a restricted basis since early in the year.

Similarly, the Bureau of Reclamation has been ordered to halt work on six projects, four of which had been assigned low ratings two months ago (*ENR*—Aug. 13, p. 201) with the idea that only non-critical work could proceed. These are now ordered to halt. In addition, the active portion of the bureau's program is cut by a WPB order to stop work on Keswick Dam and on generator number 5 at Shasta Dam. These jobs previously had high ratings, although neither was scheduled for completion until 1944.

The low ratings previously assigned to the East Powerhouse at Grand Coulee Dam, and to generators 7, 8, and 9 in the West Powerhouse at that project has now been revoked entirely.

Ickes objects

Secretary of the Interior Ickes has appealed to WPB to reconsider its decision on the reclamation projects, and meanwhile he has ordered work on the projects to proceed. Early this week, work was still under way. If the projects are shut down, the bureau and the contractors on the projects will be faced with a serious problem, since most of the construction and supply contracts have no cancellation provisions in them. Arrangements will have to be negotiated, or settled in court, on several hundred projects.

Status of flood control river and harbor projects is now being thrashed out between WPB and the War Department, and is expected to be settled in a week or so. Since several dozen projects have been dropped since the start of the war, it is not expected that the further cut will be very deep, but some projects—still far from completion—may be eliminated.

Even more unsettled is the status of definite war projects. Those involving the expansion of raw material supply—rubber, high octane gas, and metal-production plants will be untouched, in the main. Discussions are now underway as to many manufacturing plants, particularly those that are still in the projected stage.

Decisions as to plant expansion are dependent on the freezing of munitions production schedules—a thing which has never been done as yet.

The controlled materials plan for distribution of scarce metals announced this week which is intended to take the place of the priority system in the second and third quarter of next year, contemplates just such a freezing of production schedules. This will be the biggest effect of the plan on the construction industry. It will also involve certain changes, not yet entirely settled, in the method of obtaining materials for projects. Biggest change will be that necessary for submitting complete bills of materials on proposed projects before they are approved. These will be combined by the Army, Navy, or WPB Bureau of Civilian Supply into over-all schedules of construction, and submitted for final approval to WPB's Requirements Committee.

WPB revises list of critical materials

A revised list of critical materials for construction of highways, bridges and culverts has been issued by the specifications branch, conservation division of the War Production Board. The original list was published in *ENR*, May 14, p. 824. The revision follows the original closely, changes being made in the recommended substitutions where conditions have changed since the first list was published. Principal additions are structural timber, timber piling, and creosote for lumber treatment.

• • •

Seattle to call new bids on raising Ross Dam

The city of Seattle, Wash., is expected to call bids within a few weeks for the construction of the second step of the Ross dam on the Skagit hydroelectric development, as the result of an allocation of $1,864,760 for the project by the Federal Works Agency. The city opened bids for the first time on the project Aug. 6, when a bid of $6,146,214 was submitted. This figure, plus the amounts needed for cement, equipment, etc., brought the price above available city funds and the bid was rejected (*ENR*, Sept. 17, p. 391).

City officials announced recently, however, they would go ahead with the project, combining the federal funds with proceeds from a bond issue.

Housing continues on allotment basis

Status of the war housing program is slowly being cleared up. Housing construction will not stop.

WPB has issued new and more restrictive standards for material use in housing and has arranged with the National Housing Agency to work out quarterly allotments of materials for housing. At the same time that it issued the new standards, WPB stopped granting priority ratings to private housebuilders, apparently feeling that commercial considerations would make it impossible to conform to the new standards or to insure with sufficient rigidity that only war workers would occupy the houses.

Congressmen who have been in touch with WPB on this question say they have been assured that the ban on private housing will be rescinded. NHA has proposed to WPB an arrangement by which the allotments for housing would be turned over to NHA, which would assume the responsibility for dividing up the materials as between public and private builders and for seeing that the material-use standards are complied with.

The new housing standards forbid construction of single family dwellings except when the lot is contiguous to all utilities.

Exterior wall construction must be masonry or some lumber substitute except in areas where such materials are not procureable. Definite limits on the amount of lumber that may be used are imposed—for instance, a single-story dwelling unit with bedrooms may not use more than 5.3 bd.ft. per sq.ft. of floor space. Likewise, the floor area per dwelling unit is limited—thus, the maximum area for a single-story, two-bedroom unit is 720 sq.ft. Limitations are put on the heating and plumbing facilities (i.e. one plumbing stack per single-family dwelling) that may be installed in these dwellings.

OBITUARY

George Frederick Maddock, 71, until recently a consulting engineer for the public utilities division of the SEC in Washington, D. C., died Oct. 28 at his home in Stockton, Cal.

F. Herbert Snow, 76, former chief engineer of the Pennsylvania State Highway Department and of the Pennsylvania Public Service Commission, died at Harrisburg Oct. 29. At the time of his death, he had been a consulting engineer to the city of Harrisburg. One of the organizers of the Engineers Society of Pennsylvania, Dr. Snow also was made head of the sanitary division of the State Health Department when it was created in 1906.

Charles H. Schmidt, 65, for the past 40 years a construction superintendent in California in charge of work on many larger office and apartment buildings, died recently in San Francisco.

Clayton O. Judson, 54, city engineer of St. Joseph, Mo., died recently. Mr. Judson had been city engineer since 1936, and previously had served a term in the state legislature.

Charles Davidson, 58, construction engineer for the Rock Island railroad at Vienna, La., died recently at Ruston.

Leo H. Kesselring, civil engineer for the War Department in the Rock Island district for many years, died Oct. 22 at Burlington, Iowa. He had been a lifelong resident of Keokuk, Iowa.

Samuel J. Mott, 71, city engineer of Saratoga Springs, N. Y., and for many years consulting engineer for the Saratoga Racing Association, died Oct. 28.

Peter J. Veniot, 49, Bathhurst, N. B., civil engineer, died at Montreal Oct. 24.

Phillip L. Wilson, 65, president of the South Florida Contracting & Engineering Corp., of Key West, Fla., died Oct. 27.

William F. Jenrick, 56, chief estimator in the construction department of the Stone & Webster Engineering Corp., died Oct. 24 at Waban, Mass.

J. C. Park, engineer for Cole, Carley & Hudkins, equipment owners on the Bluff Creek dam project in Oklahoma, died recently.

CONTRACTS AND CAPITAL

ENGINEERING construction volume for the short week due to the Election Day holiday totals $137,412,000, more than triple the volume for the corresponding 1941 week, and it tops the $103,282,000 reported for the preceding week. Federal construction accounts for 91 percent of the current week's total and is 428 percent higher than a year ago. The increased federal volume boosts public construction 292 percent above last year. Private work, however, is 25 percent below the 1941 week.

The week's volume brings 1942 engineering construction to $8,461,997,000, an increase of 60 percent over the $5,294,419,000 reported for the 45-week period a year ago. Private work, $520,285,000, is 52 percent lower than in the 1941 period, but public construction, $7,941,712,000, is 88 percent higher as a result of the 138 percent gain in federal work.

In the classified construction groups, gains over last week are in commercial and public buildings. Gains over the holiday-shortened 1941 week are in waterworks, public buildings, and unclassified construction.

New capital for construction purposes for the week totals $1,262,000. This new financing, entirely state and municipal bond sales, compares with $129,704,000 reported for the corresponding week last year.

New construction financing for the year to date, $9,557,260,000, is 54 percent higher than the $6,218,910,000 for the 45-week period in 1941.

CONTRACTS

(Thousands of dollars)

	Week Ending Nov. 6 1941	Oct. 29 1942	Nov. 5 1942
Federal	$ 23,658	$ 89,750	$125,040
State & Municipal	9,276	6,045	3,868
Total public	$ 32,934	$ 95,795	$128,908
Total private	11,275	7,487	8,504
TOTALS	$ 44,209	$103,282	$137,412

Cumulative

1942 (45 weeks)	$8,461,997
1941 (45 weeks)	$5,294,419

Note: Minimum size projects included are: Waterworks and waterways projects, $15,000; other public works, $25,000; industrial buildings, $40,000; other buildings, $150,000.

NEW PRODUCTIVE CAPITAL

	Cumulative 1941 45 weeks	1942 45 weeks
NON-FEDERAL	$1,267,792	$590,362
Corp. Securities	322,119	170,489
State & Mun.	388,683	206,718
U.S.H.A. loans	30,399	.....
R.E.A. loans	100,500	.....
R.F.C. loans	263,091	130,455
Fed.-Aid—Highways	163,000	82,700
FEDERAL	$4,951,118	$8,966,898
TOTAL CAPITAL	$6,218,910	$9,557,260

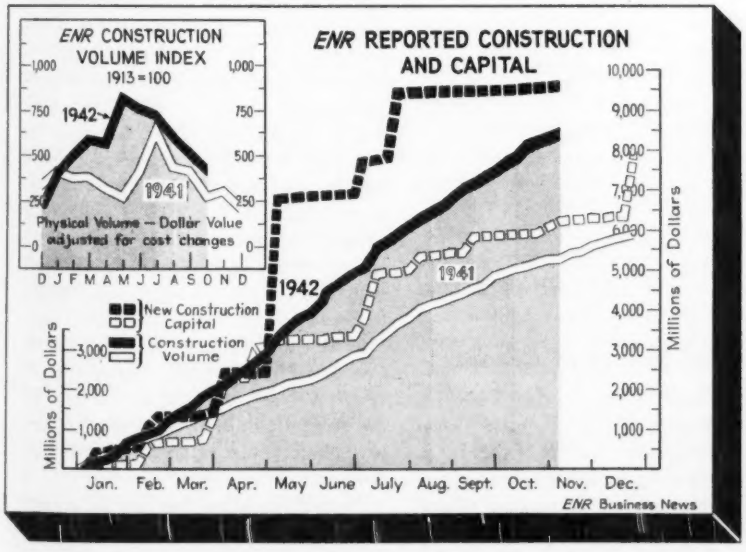
ENR INDEX NUMBERS

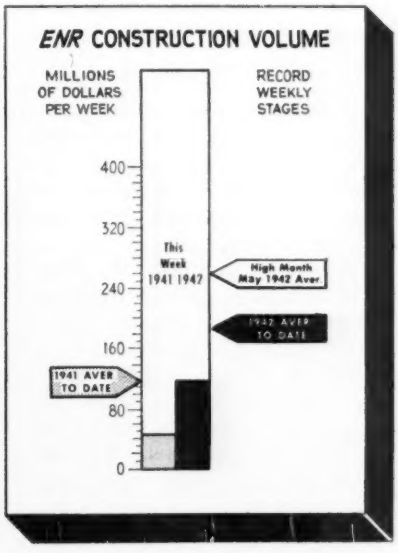
Index Base = 100		1913	1926
Construction Cost	Nov. '42	283.64	136.35
Building Cost	Nov. '42	226.58	122.48
Volume	Oct. '42	421	185

FHA MORTGAGES

	Week Ending Oct. 25 1941	Oct. 17 1942	Oct. 24 1942
Selected for appraisal			
Title II	$20,995	$5,296	$4,987*
Title VI	$4,262	$19,114	$14,079*

*Subject to revision.


ENR CONSTRUCTION VOLUME INDEX
1913=100
1942
1941
Physical Volume — Dollar Value adjusted for cost changes
D J F M A M J J A S O N D
ENR REPORTED CONSTRUCTION AND CAPITAL
New Construction Capital
Construction Volume
Millions of Dollars
Jan. Feb. Mar. Apr. May June July Aug. Sept. Oct. Nov. Dec.
ENR Business News


ENR CONSTRUCTION VOLUME
MILLIONS OF DOLLARS PER WEEK
RECORD WEEKLY STAGES
This Week 1941 1942
High Month May 1942 Aver
1942 AVER TO DATE
1941 AVER TO DATE

Comment and Discussion

Readers' opinions on matters that concern engineers and contractors

No Lack of Engineers

Sir: From time to time in the last few months, *Engineering News-Record* has published statements to show that there is a shortage of engineers to carry on the work of war construction. In the July 2 issue, you quoted the Chief of Engineers as saying that he had milked the profession dry of men. Then you quote E. B. Black, president of the A.S.C.E., as saying that the employees of engineers should do all in their power to release engineers to the army. In your issue of Sept. 24, you publish a letter, signed by one of the Army area engineers deploring the fact that he had been unable to obtain competent engineers at the same time that the Connecticut Highway Department had been using engineers to guard bridges. On the next page of the same issue, you have an editorial in which you say that there is a shortage of engineers; that the voluntary system of procurement had broken down and suggesting that some system of drafting competent men should be used.

A statement of this kind is made without any knowledge of the facts as we know them. Engineers of the Texas Society have begged and implored the Army to use them, but the impression gained is that the Army is seeking men not over 40 years old with not less than 30 years experience and who are willing to work for a buck private's pay.

The voluntary system of procurement has not broken down due to a shortage of engineers nor due to lack of their willingness to serve, but has failed to function solely because the Army has not accepted those who have volunteered.

As early as July 1940 the Army began asking the engineers to fill out questionnaires and come to various army posts for interviews and examinations. Almost without exception, they have been rejected. We know of men who have had no less than nine interviews and a like number of physical examinations who have been rejected.

At a meeting of the Travis Chapter of the Texas Society of Professional Engineers, held a few days ago, fifty engineers were present. Almost without exception, all repeatedly had tried to get into war work and they all had been brushed off in a more or less patronizing manner by various army officers. Many of these men had Civil Service ratings as engineers and senior engineers; three of them were former state highway engineers and the Army had, without exception, told them that there was no place that they could fill. The engineer officer of the Eighth Service Command is very reluctant to employ men from civil life in positions higher than associate engineers.

At this time, the Army is beginning to draft engineers through the Selective Service as privates, although some of these men have had more than fifteen years experience in executive positions with the Texas Highway Department.

If the Army really wants engineers, and is willing to pay salaries commensurate with the work to be done, the Texas Society of Professional Engineers will be glad to furnish them with a large number of qualified men. The State of Texas has more than five thousand registered engineers but only about 250 of that number have been called into the services. It must be understood that the Army is in earnest and that the available men are not to be asked to fill out additional questionnaires. The engineers of Texas are thoroughly disgusted with filling out questionnaires.

JAMES P. EXUM,
President, Travis Chapter,
Texas Society of Professional Engineers

R. S. GUINN,
Secretary-Treasurer

DAVID DOAK RAINEY

Army Studies of Cement

Sir: Your notice on the "First Interim Report on the Cement Durability Program" (*ENR* Oct. 1, p. 506) was welcomed. The phraseology of the review was somewhat disappointing. The reader is led to believe that the entire program was based on "six types of treated cement." This is very far from the facts. There were 52 samples of cement collected from 47 mills distributed throughout the country. The six samples of treated cement were, originally, entirely incidental to the program. The fact that they disclosed information of outstanding value was simply one of those coincidences which do occur in engineering research.

CHARLES E. WUERPEL
Senior Engineer,
Central Concrete Laboratory,
Corps of Engineers, U. S. Army,
Mt. Vernon, N. Y.

Steel Stress and Fireproofing

Sir: Just as I take up my pen to continue the discussion on "Higher Steel Stresses" the War Production Board (Directive No. 8 issued by Office of War Information, Sept. 10, 1942) issued a mandatory order stipulating that after Nov. 9 the basis steel stress for building construction shall be 24,000 psi. (*ENR* Sept 17, p. 389.) The only regrettable part of this order is the fact that it was not issued many months ago and that it does not yet apply, even with certain reservations, to ship construction. Since the WPB has now practically banned the use of structural steel for building construction in order that every available pound can go into more and more ships this conclusion is immediately obvious.

Despite this definite settlement of the subject under discussion it might be of general interest to look into the objection raised by J. G. Shope (*ENR* Aug. 27, p. 279) to the writer's (*ENR*, Aug. 13, p. 209) proposal to raise steel stresses one-third—which incidentally meant to 24,000 psi. and not to 26,667 psi. His objection is solely from the fire hazard standpoint and he suggests that if this proposal is adopted then ". . . steel should be fireproofed to make it at least as strong under a temperature of 800 deg. F . . . etc." I refer Mr. Shope to Section 4 of "The American Institute of Steel Construction Specification for Fireproofing," paragraph F, which states ". . . and at 800 deg. F. the strength of structural steel is approximately the same as its normal temperature strength."

Notwithstanding this fact the writer recognizes the danger of fire but feels

that for the following three reasons he does not believe that fire hazard *alone* should be given too much weight when a decision involving a possible saving of 1,000,000 tons of one of today's most important metals —steel—is (now I should say was!!) trying to be made.

1. Really bad fires would quickly attain temperatures fatal to unprotected steel whether the design stresses were 18,000 or 24,000 psi. (In the Standard Fire Test a temperature of 800 deg. is reached in 5 min. and a temperature of 1,300 deg. is reached in 10 min.)
2. Unprotected structural steel subject to serious fire hazard accounts for only a small proportion of the total used—even here a study of fire losses from this cause will show that they are small in comparison to the country's total fire loss.
3. By far the greater proportion of all steel frame construction is built in accordance with one or another of the hundreds of building codes governing this type of construction and even where construction is outside of code areas these buildings are nearly always engineered by men familiar with code requirements. For this reason it will generally be found that the fire hazard has been duly considered in the design and that the structure has been fireproofed in one way or another within its economic limits.

As a matter of fact, now that the steel stress matter has been so definitely settled (for buildings at least!), it might be interesting to discuss the very important matter of the general subject of fireproofing of structural steel. In the writer's opinion most codes are still in the horse and buggy days on this subject. Nearly all of them still require that the structural members of a Type 1 or Class A Fireproof or Fire Resistive structure shall "be entirely encased in concrete poured in place and extending not less than 2 in. beyond all surfaces of the members, or shall be encased in not less than 4 in. of brick or terra cotta tile—etc.," without regard to the type of occupancy of the building or of its combustible contents. This amount is generally acknowledged to give a 4 hr. fire resistance.

This protection is still required notwithstanding the fact that modern research has definitely shown that "fire-resistive" office buildings, apartments and the like type of occupancy have a combustible content of less than 10 lb. per sq.ft. of floor area (actually only 3 to 7 lb.) and that according to the "Burn Out Tests" conducted by the Bureau of Standards this represents a maximum fire hazard of only one hour.

Using the A.I.S.C. Fireproofing Code recommended safety factor of $1\frac{1}{2}$, this type of building therefore requires only a $1\frac{1}{2}$-hr. fireproofing instead of the four hours now required by most codes. Think of the savings in materials (many of them critical) —and money—which would be effected by "engineering" the fireproofing as well as the stress!

G. M. Zucco
Structural Engineer
Seattle, Wash.

Economical Timber Trusses

Sir: The writer is much interested in the several *ENR* articles published recently covering wood roof construction. Nearly all the projects have extensively used the timber connector. While it is recognized that timber connectors are valuable for many uses, the universal use of them in simple roof trusses results in excess labor and material, and consequently cost, to say nothing of the general ugliness in the appearance of the completed trusses.

In the article entitled "Fast Truss Fabrication" in *ENR* Sept. 24, 1942, p. 440, the following is quoted as a good description of the method of procedure: "The trusses were first laid out complete, that is, every member was placed in its right position, and toe-nailed, temporarily. Then the bolt holes ($\frac{13}{16}$ in. for $\frac{3}{4}$-in. bolts) were bored, after which the assembly was dismantled for routing of split-ring grooves. These grooves, 4 in. in diameter, were routed $\frac{3}{8}$-in. deep. Next, the trusses were reassembled with the split rings and shear plates in place, and then the members were bolted together. All boring, routing and bolt tightening was with electric tools."

If bolted joints had been used without the connectors, more bolts would of course, have been used, but it would not have been necessary to dismantle the trusses after the members were toe-nailed. Holes could have been drilled through the diagonals and truss chords and the trusses bolted immediately. This plan would have saved more than one-half the time consumed in the framing of the trusses. One 4-in. connector and $\frac{3}{4}$-in. bolt gives approximately the same bearing area in a 4-in. member as two 1-in. bolts. The bearing area on the bolts, however, can be more nearly balanced around the axis of the member than when the connector is used in framing the truss.

Wood trusses used for any purpose will sag under the dead load aided by live load applications on the structure. Some method should be provided in the design of the truss to permit camber of the lower chords from time to time. This scheme practically means raising the entire structure. When the design is of the Howe, or modified Howe type, with the tension members of steel bolts, vertical or nearly so, the camber is best put in after the truss members are bolted by tightening the tension members while working simultaneously from both ends. Two men will camber a 50-ft., 6-panel truss in one-half hour, putting into the lower chord a smooth curve with a mid ordinate of 2 to 3 in.

One group of approximately sixty, 50-ft. trusses, designed by the writer in 1916, were cambered when erected in the manner just described. In 1936 the trusses had sagged the original 2-in. camber plus $1\frac{1}{2}$ in. The bolts were tightened up in the manner explained and the whole roof structure raised up 3 in. or more. After 26 years of service, these wood trusses appear to be sound and good for another 25 years. Other modified Howe trusses of 50- and 60-ft. span, designed and erected in 1917, were cambered $3\frac{1}{2}$ in. in the same manner. In 1927, the truss rods were tightened up a second time, and in 1942 a third time. The trusses are now in excellent condition and will apparently carry the roof structure of the buildings for a long time.

Under normal conditions, 50-ft. roof trusses with top and bottom chords of wood, tension members of steel or iron, and diagonals of timber are designed for a total load of 50 lb. per sq.ft., should be fabricated and erected for $2.00 per lineal foot.

G. L. Bilderbeck
G. L. Bilderbeck, Inc.
Groton, Conn.

EDITORIALS

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November 5, 1942

Lost Battalions

GENERAL KNUDSEN, speaking at a dinner in New York to launch a campaign for greater safety in industrial operations, urged his hearers not to let there be any lost battalions at the front due to lack of guns and ammunition that were not produced because of battalions lost to industry through avoidable accidents. General Knudsen's warning should be heeded by the construction industry, especially that ever-increasing part of it that is going into new fields such as ship-building. New operations call for new knowledge as to accident risks. Only by eternal vigilance in discovering these risks and protecting against them can men be kept from joining the lost battalions of industry that may handicap our men at the front.

Two Milestones

THIS WEEK the American Society of Civil Engineers reaches the ninetieth anniversary of its organization and the seventy-fifth anniversary of its career as an active factor in American life. Though organized in 1852, the society lay dormant through the Civil War period and did not begin to grow progressively until its revival in October, 1867. Membership has increased from less than one hundred in 1867 to well over 17,000 at the present time, not counting 4,500 student members. But growth in scope of activities has been more significant than growth in members because it is evidence of development that often has called for vision and generally has been made over the strong opposition of men who oppose any change. Early in the society's history, attempts to have it do other than hear, discuss and print scientific papers were turned down as being outside the scope of such an organization. But in the end those who advocated expanding the society's activities beyond the purely technical aspects of engineers' work won out, thereby setting a precedent that has been followed for many years. Outstanding among such new activities in recent years is the society's work in setting equitable wage rates for engineering employees and in aiding in having them put into effect. Meanwhile, the original concept of a scientific organization has not been neglected. Here also the record of accomplishment is an imposing one. Looking ahead, new problems can be seen taking shape, but if met in the spirit that marked so much of the past record, they stand only as a challenge to greater accomplishment.

Protective Concealment Specialists

AN EXAMPLE of opportunity arising from war activities is the rapid induction of structural engineering talent into protective concealment work wherever extensive plant camouflage has been undertaken. At first the call was for artists and painters to tone down sharp color contrasts, provide neutral color tones to blend with backgrounds, or to break the regularity of existing forms and outlines. Later, particularly in certain industrialized areas, the problem was approached from a new angle, namely to use screens and garnish that introduce entirely new and different shapes and patterns, changing the original outline as well as the color. From this came the urgent call for those able to work out special structural engineering problems. Catenary systems, both vertical and horizontal, had to be designed for lightly loaded spans exceeding 200 ft. (a field in between that of the telephone or power engineer and the suspension bridge designer): and unusual problems had to be solved in anchoring and supporting networks carrying garnish and in preventing "flag action." Although still in the development stages, this new structural field seems to promise its own set of standards as well as a group of specialists to apply them.

Fighting Snow on Airports

SNOW IS AN AID to the enemy if it cripples our transportation by slowing down trains, trucks or busses or if it stops flying by making our airports and military airfields unusable. Years of experience have taught us how to keep snow from interfering with transportation on our railways and highways; we have much less knowledge of how to keep it from blocking use of airfields. And such knowledge as we have is limited to relatively few operators of commercial airports. Those who must maintain the many military airfields that have been built in the last few years generally lack knowledge of methods and of machines that are available for keeping airfields open during winter months.

It is to that end that a special section in this

issue is devoted to a report on modern methods of snow removal and to descriptions of machines that are available to do the work. The information on which this report is based has been gathered from many sources. It covers the whole range, from the simple problem of clearing the occasional snow that may fall on fields in the more temperate regions to compaction of snow as is practiced on fields in Canada where climatic conditions make removal impracticable.

Compilation of this information has brought out the fact that present procedures are based largely on highway practices and that the available machines similarly are the outgrowth of attempts to meet railway and highway needs. Airports, with their wide runways and large expanses of taxiways, appear to call for modification of these methods or possibly for development of entirely new methods as well as for improvements in the equipment. It is to be hoped that a thorough investigation into the whole problem of winter airport maintenance will be undertaken this winter so that before another winter comes around we will know how methods and machines can be improved. The cooperation and facilities of the equipment manufacturers, the commercial airlines and others should be enlisted to make this a fully comprehensive and worthwhile study.

Engineering Manpower

MANPOWER is constantly in the headlines these days. Everywhere there is evidence of a lack of the right kind of manpower in some places and a shortage of any kind in others; there also is wasteful shifting from job to job and inadequate planning to meet the further shortages that our expanding war program will bring as more and more men are drawn into the armed forces.

On a preceding page, Texas engineers raise question as to whether there really is any shortage of engineers, citing the efforts of older engineers in that state to get into army work. Their case is not peculiar to Texas, nor does it prove that there is no shortage of engineeers, especially when that term is used broadly to include technicians in the engineering field. The principal shortages in war industries are in the mechanical and electrical fields, and the principal army shortages are in civil engineering positions that must be filled by young men because they are in active combat units.

This is not to say that there is no justification for the complaint registered by the Texas engineers. Much evidence can be found to demonstrate that the Army is not making full use of older men who are physically able to fill many jobs that the Army has to offer, freeing younger men for active duty in the combat forces.

But the Army is not alone in its unwillingness to employ older men. Industrial organizations have the same failing. They want young men who can be started at a low rate of pay and be advanced as they develop skill and ability. Industry does not want the older men who must be paid higher salaries and have less useful life ahead of them. Also, industry wants the younger men because they can be trained much more quickly.

It is this refusal of industry as well as the Army to face war conditions realistically that makes some form of manpower control imperative.

In the engineering field such control ultimately may have to be vested in an agency similar to Canada's Wartime Bureau of Technical Personnel through which all changes in engineering positions must now clear. But because our industrial system is much larger and more cumbersome than Canada's, such a system should not be made compulsory until voluntary application of the system has proved to be a failure. As a first step, all engineers who seek to serve their country in the armed forces and all now in non-defense jobs who are willing to take jobs with war industries should be called upon to file their names and special qualifications with the Roster of Scientific and Technical Personnel, now under the jurisdiction of the War Manpower Commission. Coupled with this must be expanded facilities for providing engineers who shift to new work with refresher courses where that is necessary.

Yet any such move will be ineffective unless it gets wholehearted support from the Army and from industry. There must be a willingness not only to take on older men but also to release younger men—from desk jobs to combat forces in the Army and from their present jobs in industry to the armed forces. We have the manpower, but it cannot do its full part in winning the war without a willingness on the part of military authorities and industry to use it most effectively.

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Wood Piles With Mortar Coating Save Time and Critical Materials

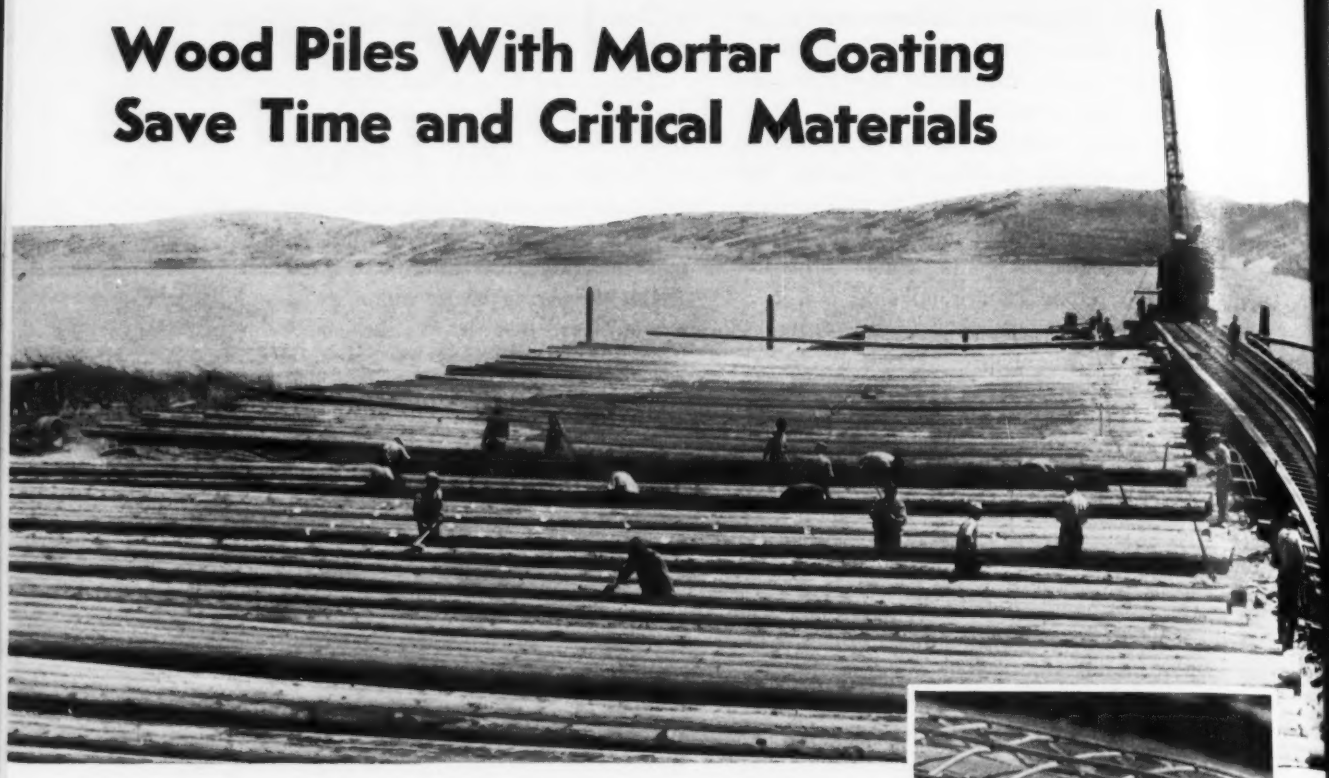


Fig. 1. Piles are notched, coated with mortar and cured on parallel skidways.

Contents in Brief—*Technique for putting a sand-cement protective coating around long, untreated wood piling was developed by the U. S. Engineer Department for a rush pier job when there was available neither creosote-treated piling nor equipment for driving long reinforced concrete piles. The resultant structure has such strength, rigidity, and durability that more widespread use of the protective method began immediately and 45-ft. portions of 100- to 125-ft. piles on other jobs are now being protected in this way.*

A PIER OF STRONG, durable construction that was required for military service at a date earlier than it could have been built with either creosoted piles or reinforced concrete piles, was completed on the required date by making use of untreated wood piles coated with a protective layer of sand and cement. Not only have all specifications for strength, rigidity and durability been met by this type of construction but the pier was finished some three months ahead of the time that would have been required to build it with creosoted piles under existing delivery dates for treated piles.

Early this year when orders were received to have a certain pier constructed before the end of July, the U. S. Engineer Department ruled out the use of untreated piles because of the great activity of marine borers at the site. However, piling protected by creosote impregnation could not be obtained until a date considerably later than the required time of completion and equipment for driving long reinforced concrete piles was not to be had. Steel piles were not obtainable and pressure treatment plants that apply chemicals other than creosote were already loaded with rush orders. Untreated wood piles encased in a precast concrete jacket would have required the use of a double amount of equipment that is now difficult to obtain; moreover, their manufacture would call for considerable amounts of critical materials and construction operations would be slow.

Untreated wood piles protected with alternate layers of tar and felt

Fig. 2. Wire mesh reinforcing is held, by staples and steel plates, ¾ in. from wood surface.

were a possibility worthy of consideration if some more durable form of protection could not be found. The best prospect, it was decided, would be in untreated wood piles protected with a coating of sand and cement shot on with pneumatic equipment to embed wire mesh reinforcing.

After deciding on this type of construction, some quick experimental work was done with 30 untreated Douglas Fir piles ranging from 85 to 105 ft. in length. Sizes varied

from 5-in. tip and 14-in. butt to 9-in. tip and 18-in. butt. Some of these piles were coated without first cutting into the wood surface for anchorage; on others notches were provided by using axes to make cuts 1-in. deep over 4x4-in. areas, spaced 2 to 6 ft. apart. Three and four rows of such notches, staggered, were used per pile.

Reinforcement for the protective coating consisted of 2x2-in. electrically welded steel wire mesh. Experiment was made with wire sizes ranging from No. 16 to No. 10. This mesh was put on with 4-in. laps and for experimental purposes was fastened at distances ranging from $\frac{3}{8}$ to 1 in. away from the outer surface of the wood.

Beginning at a point 8 ft. above the butt, the next 50 ft. of each pile was coated with a sand-cement mixture. Although most of this was applied relatively dry, on some piles the mix was made rather wet as a test of relative merit. Application was made with standard pneumatic equipment. Both high-early-strength and standard Portland cements were used in 1:3 and 1:4 proportions of cement and sand. Experiment was made with protective coatings in thicknesses of 1 to 3 in. and the test piles were cured for three to seven days.

After the curing period the test piles were picked up with a two point support, and moved by truck and trailer to the driver that was equipped with a single acting steam hammer striking 60 blows per minute. Some of the test piles, struck as many as 100 blows after being driven to refusal, were cut off below the mud line and lifted out for examination.

These experiments showed that properly applied protective coating of this type can be handled and driven without damage. When damage did occur it usually appeared immediately—after the first few blows of the hammer—and was nearly always within the top 10 ft.; most often within the top 5 ft.

In the few cases where the coating shelled off, this occurred in small widely-spaced patches; usually the portion of the coating outside the reinforcing mesh was the only part affected. A wet mixture seemed to add to the likelihood of the coating shelling off. This type of failure appeared most frequently where the thickness was least.

There also was a tendency for the coating to slide up the pile. This was greatest where the coating was thickest and where no notches had been made in the wood. In some cases large cracks opened up around the pile and the wire mesh showed tension failure. When the coating was thickest, some small cracks occurred in the vicinity of the notches. No advantage resulted from a groove in the wood to thicken the layer of coating at its lower end.

Many instances were noted of very fine cracks or checks in the coating, more often circumferential but sometimes in a longitudinal direction. They were usually about 12 in. apart and so fine as not to be readily visible unless dampness in an otherwise dry surface made them noticeable. All these cracks occurred during curing and were not affected by handling or driving. After the piling was in the water, the cracks tended to fill up with a very fine silt.

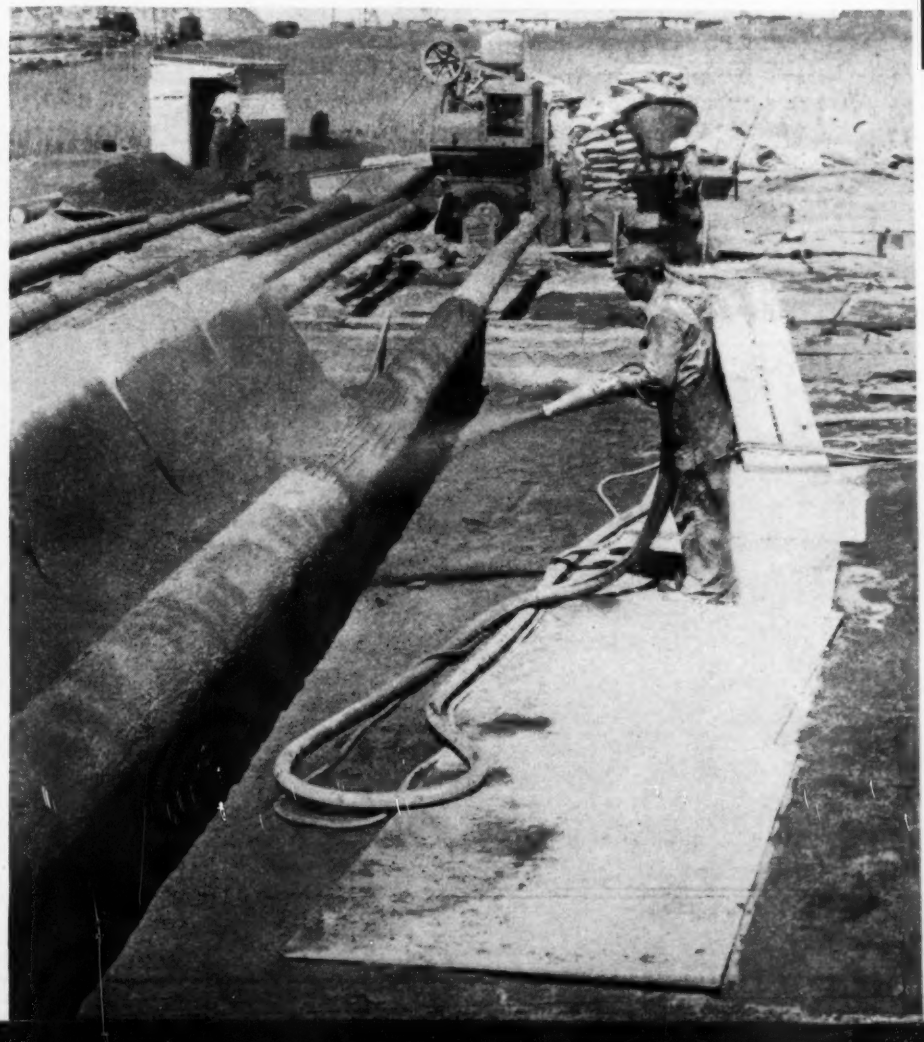
No advantage was found in use of the high-early-strength cement. (It was discovered that coatings only 3 days old made with standard Portland cement could be driven without damage). The piles could be handled without injury using only one line to pick them up and put them into place in the driving leads. Finally, it was observed that when the coated piles are in place they are very much stiffer and vibrate much less in swift current than do timber piles without a protective coating.

Conclusions about the coated piles rate them as practical, economical and satisfactory in all respects. Expert opinion is that the small cracks that occur in the curing process are not of a character to give marine borers access to the pile itself and that all other cracks can be avoided by proper manufacture.

Accordingly, use of this type of pile was approved for that portion of the pier for which creosoted piling was not available. Specifications for the coating, based on the results of the experiments noted in the foregoing contained the following stipulations:

Minimum tip diameter of the piling should be 6 in.; 4x4x1-in. notches in

Fig. 3. The sand-cement coating was applied with standard, compressed air equipment for as much as 45-ft. of the length of 125-ft. piles.



the wood surface should be made at intervals of 2 ft.; the wire mesh reinforcing of No. 12 or No. 14 wire should be 2x2-in. mesh held out ¾ in. from the wood surface at all points. The top and bottom 6 in. of that portion of the pile given the protective coating should be wrapped with 6 turns of No. 9 galvanized wire, put on over the wire mesh, as additional reinforcing at these points.

The piles should be thoroughly wet prior to applying the protective coating and the mix should be kept as dry as it is workable in standard compressed air equipment. A coating 1½ in. thick is recommended as optimum. The coating should be cured for a minimum of three days under a water spray or with water and burlap.

The construction yard laid out to meet these requirements on the initial job where 1,529 of the coated piles were used, included two 400-ft. skidways, between and parallel to which was a railroad track accommodating a locomotive crane. Each skidway was in effect a production line, at one end the piles were unloaded from railroad cars and at the other end cured, coated piles were delivered. The skids were timbers supported 2 ft. above ground so that the piles would rest on this 2-point support at a convenient working height. As piles progressed by being slid along the greased skids, they were successively notched, encircled with wire mesh, thoroughly wetted, covered with the protective coating and cured with water sprays.

Fig. 4. Types of protective coating failure such as need not occur with proper methods of application.

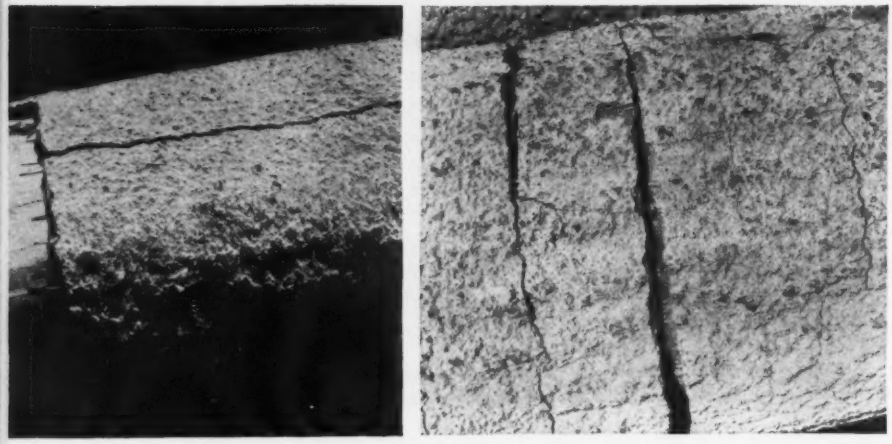
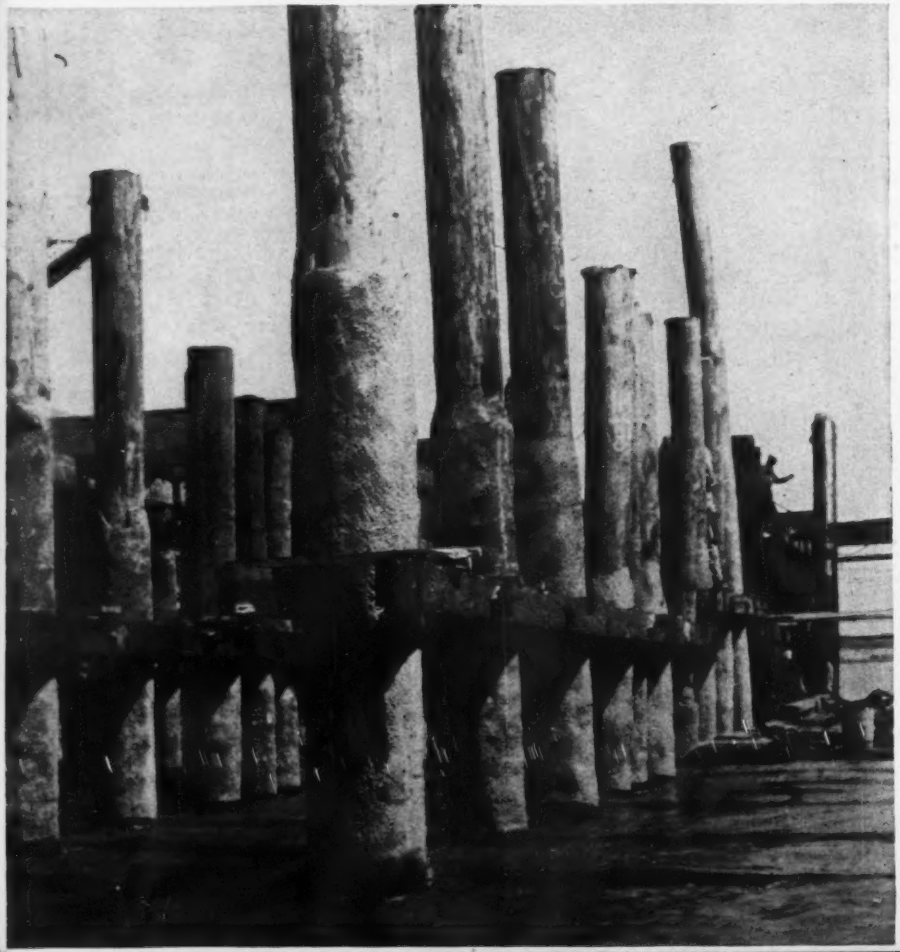


Fig. 5. Appearance of piles after driving and before being cut off at cap level.



The locomotive crane unloaded the untreated piles from flat cars, at one of the skidways, rearranged them along the skids when necessary and loaded them on to rafts in the water at the completion end of the line. Small air-driven hoists, on either side of each skidway provided power for sliding the piles forward as required.

After the protective coating was on, the piles did not have enough buoyancy at the coated end to float unaided. To facilitate floating them to the driver, dry timbers were lashed into the rafts.

No difficulty was encountered in driving these piles with a single-acting steam hammer striking 60 blows per minute. (5,000-lb. striking part, 15,000 ft.-lb. in 3 ft. fall.) Damage to the coatings as the result of driving occurred on only a few piles and was ascribed to improper treatment, such as getting the wire mesh too close to the wood or use of too wet a mixture.

Despite the fact that the urgency and haste of the work made for extra cost, that considerable expenditures were made for experimental work (which provided much valuable information that will be useful on other projects), and that the coating described gives the necessary protection with much more stiffness and much less tendency to vibrate than in the case of creosoted piling, yet the total cost of the job was $40,000 less than the estimated cost for a creosoted pile structure.

The protection for piles thus provided was so satisfactory in all respects that a still larger project nearby is following the same technique at the very large saving in cost.

Experimental work on the coatings as well as construction operations were planned and supervised by the Corps of Engineers, U. S. Army.

West of Leadville, Colo., U. S. Route 24 is being relocated because the old road had to be closed where it ran through a war camp. The old road is at the lower level in this picture.

Roads Under War Restrictions—III

PROBLEMS ENCOUNTERED by state highway engineers due to war restrictions have been reported in two previous issues of *Engineering News-Record* (Oct. 8, p. 484, and Oct. 22, p. 555). Such matters as declining revenues and loss of men to military service or war industries are common to most states but are intensified by peculiar circumstances in a few instances. In the following, the manner in which Iowa, Colorado and Utah, are meeting today's conditions are reported from interviews with heads of the highway departments.

IOWA REVENUES DECLINE RAPIDLY

Loss of revenue because of a heavy drop in gas-tax collections is the biggest problem facing the Iowa State Highway Commission, according to F. H. Mann, assistant chief engineer and construction engineer. The rate of return has been dropping steadily all year, with June and July showing a loss of 33 percent as compared with the same month for 1941. This ratio will probably hold for the year's average, but may go as high as 50 percent.

Normally, the gas tax and license revenues run about $21,000,000, of which the highway commission gets the first $17,000,000. The remainder goes to match federal aid for counties. However, out of the state's share of $17,000,000, about 80 percent, or $13,500,000 is pledged for fixed charges as follows: $8,500,000 for bond interest and amortization; engineering, $1,000,000; maintenance, $4,500,000. The remaining $3,500,000 goes for construction. If the revenue drops as much as 50 percent it means everything but the fixed bond charges will be wiped out—all construction, engineering and maintenance. Headquarters operations are charged to engineering. Field activities, especially construction, have been curtailed this year as the revenue dropped off.

Maintenance kept up

Iowa was caught in the oil-freeze order of last June, but the materials for maintenance were already on hand and much of the season's work has been completed or is well started, so the 1942 maintenance schedule will be carried out practically in full. Some trouble has been experienced in getting certain supplies and equipment but not enough to cripple the program. Maintenance equipment is in excellent shape, despite difficulties in getting repairs and the cancellation of new equipment orders.

Maintenance forces have been cut down by losses to war work and to the armed services, but the pinch was not felt until most of the season's work had been completed.

Construction

Construction operations this year have been principally on access roads to military projects. Some of these were built exclusively with state funds; others were financed by the federal government from the access road funds. There have been 20 access projects in all.

Otherwise, new construction has been largely confined to small grading projects and several larger jobs on secondary routes. Paving has been completed on some previously graded

projects, 5 to 6 miles long. On primary routes, a few stabilized base projects have been completed, including a 13-mile stretch of calcium-chloride stabilization in Freemont County and an 11-mile oil-stabilization job in Winona County. This last job was caught in an uncompleted stage by the oil freeze and was finished with gravel. Two oil-surfacing projects likewise caught were completed by graveling.

Oil for emergency work

Oil is available under certain conditions for projects necessary for the war effort. Several towns and cities were caught with torn-up streets and the state has been permitted to furnish them with the necessary oil to complete these municipal projects.

Two overhead bridge projects are waiting completion for lack of steel. A new Cedar River bridge north of Iowa City needs only a few tons of plate to complete; all the rest of the steel is fabricated and that for the approach span has been erected.

Many engineers leaving

The loss of men in headquarters, construction and maintenance divisions has been heavy. A combination of two Iowa contractors, Ralph Green of Des Moines, and C. F. Lytle of Sioux City, has a section of the Alaska Highway and many highway employees have gone with that contracting organization, including C. C. Coykendall, administrative engineer. The field force strength has fallen off in the same ratio as the work, so to date the reduction has not been serious.

The Iowa civil service law provides for unrestricted leave and one month's salary for all men going into the armed forces. Others are entitled to the best job available in their classification upon return without loss of seniority.

Fred R. White is state highway engineer.

LOSS OF MEN IS SERIOUS IN UTAH

Loss of engineers to the armed forces and to war plants, lack of mechanics to keep maintenance equipment in proper repair, and a reorganization of the department are worrying the Utah State Roads Commission a lot more than loss of gas-tax revenue, according to John Evans, chairman, and Lester Blackner, commissioner; Leyton Maxfield is the third commissioner. War construction and transfer of army units to the state has kept up the gas tax revenues. Collections for the first seven months of 1942 were $2,528,000, as compared with $2,740,000 for the corresponding period of 1941, a loss of less than 8 percent.

Under the current reorganization, the Utah State Roads Commission is to be made quite different from the usual state highway organization. The Road Commission, along with the Aeronautics Commission, the Building Board and the Division of Water and Irrigation, make up the State Department of Engineering. Three commissioners, appointed by the Governor, head the Roads Commission, and each takes charge of one of the following branches: general office and equipment; maintenance; and construction. There is no state highway engineer nor any engineering head designated as such.

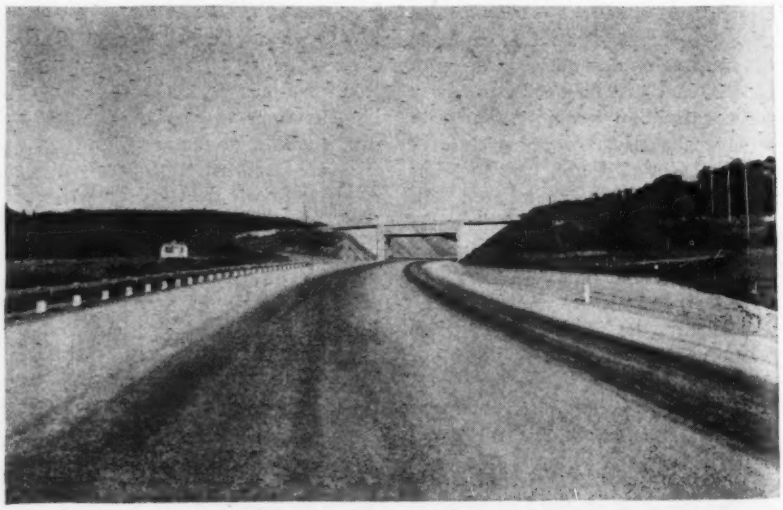
Six highway districts are administered by district engineers, who have no control over maintenance. For each district there is a maintenance supervisor, appointed by the state administration, whose powers are not clearly defined but may prove to be quite extensive.

About half of the 325 engineers formerly employed at department headquarters have left for military or other duties, and others have been sent out into the field to relieve shortages there. However, the most serious shortage of men is in mechanics for repair of maintenance equipment. The influx of war industry plants into a state where but few industrial plants formerly existed has proven an irresistable lure to the mechanics receiving relatively low wages.

Maintenance work cut

As a result, the maintenance equipment sheds are full of trucks, graders and tractors needing repairs. Maintenance throughout the state as a whole has suffered, but the more important main routes have been kept in fairly good shape by transferring workable equipment from one district to another as the need arises. Heaviest traffic is coal trucking from the Carbon and Emory County fields to the Salt Lake City area, 125 to 250 miles away. All of this traffic must pass through the narrow, steep and twisting Price River Canyon north of Helper, where the average truck count is 350 per day.

Utah is one of the ten states not affected by the oil and asphalt freeze order of early summer. Therefore, there has been no critical shortage of materials for maintenance or construction, though deliveries in some instances have been delayed. Some difficulty has been experienced in importing the heavier oils preferred for summer work. Local refineries



Typical of new construction in Utah is this wide road and underpass on Route 40 in the mountains east of Salt Lake City.

New steel-arch bridge at the east end of the Battle Mountain highway near Red Cliff. The bridge was opened last year.

produce an ample supply of high-grade light oils which can always be used if heavier oils are not available. About 20,000 tons of native rock asphalt are being used this year, principally for retread work.

Snow trouble in prospect

Snow removal is always troublesome in the mountain areas, and the commissioners expressed some apprehension about the coming winter in view of the equipment situation. However, they expect to get by with transfer of units from the desert and plains districts. Many of the mountain roads traverse narrow canyons, sharing the limited right-of-way with a railroad, which necessitates hauling of the snow because of lack of room.

A normal maintenance crew for each district is 64 men, paid an average of $5 per day, or a total of $99,840 per year. Each district pays a fixed rental charge for all equipment assigned to it, amounting to $101,000 per year. Maintenance overhead per district runs $23,000 annually, and materials cost about $24,000.

Construction operations

New construction, of course, is largely limited to projects of military significance. One of the biggest projects now under way is widening U. S. Route 91 to four lanes south of Ogden, and a bypass of this route around Ogden is scheduled for an early start. Half of a 20-mile new route near the Nevada line at Wendover is now under contract. Two rebuilt sections of Routes 40 and 530, important outlets from Salt Lake City to the east, have just been completed.

Access roads costing a total of 2½ million dollars are now under construction. These include fairly short new routes to a Jap evacuation center at Delta and a hospital at Brigham City. Longer access roads are a 33-mile stretch to a chemical plant and a 100-mile connection to a metal mill in a desert region.

Contractors are reluctant to bid on new highway work. Many are busy on war construction projects, others are apprehensive of low priorities in comparison with those of nearby war projects, which make materials and equipment difficult to obtain.

Frequently no bids are received for advertised projects, in other cases only one or two proposals are submitted. When expedient, a single bid is accepted. Often, however, it is necessary to split up the project into grading, drainage, graveling and surfacing, thereby enabling those contractors too small to get into war construction to participate in the highway work.

Lack of available contractors has forced the department into doing some construction work with its own forces, ten such jobs being under way now. To get the necessary equipment for such work the maintenance districts are further robbed of machines, which means a further reduction in maintenance work.

COLORADO NEEDS EQUIPMENT

Calls to military service and to war industries have just about cleaned out the headquarters' personnel of the Colorado State Highway Department, according to Charles D. Vail, chief engineer, and have seriously crippled the field forces. Where possible, office personnel has been shifted to the field, but in many cases the situation has had to be met by doubling up in duties. However, both maintenance and new construction have fallen off, relieving somewhat the otherwise serious shortage in personnel.

Gas-tax revenues are dropping steadily each month and estimates place the year's return about 15 percent below 1941. Last year the gross return in gas taxes was $10,195,000, but $1,362,000 was refunded to agricultural users leaving a net of $8,833,000. The highway department gets about 70 percent of the net, about $6,000,000 last year. Half of the $2,200,000 in license fees goes to the department but this income is more than offset by $1,800,000 in fixed bond-interest charges.

Under a planned replacement program, much maintenance equipment was to be bought this year and much of it was on order. Lack of priorities, however, made cancellation of orders necessary, so the department must carry on with old equipment. The machines on hand are in poor shape. By diligent repair operations the maintenance division has kept going.

The normal maintenance program runs about $3,000,000 and this year's schedule will approach that figure. Colorado does a lot of oiling with maintenance forces and this year the oiling program amounts to $1,500,000, fully half of the maintenance budget. Colorado was not under the June embargo on road oils so there has been no difficulty in getting maintenance materials.

The highway engineers are endeavoring to conserve critical materials as well as their dwindling funds. To save maintenance equipment and funds, Mr. Vail suggested closing the roads to Pike's Peak and Mt. Evans for the entire season. These are only

Hundreds of miles of Utah roads are in sparsely settled desert areas.

tourist routes, both climbing to more than 14,000 ft. elevation. However, public indignation was aroused in Colorado Springs at the foot of Pike's Peak, and a petition signed by 3,000 residents demanded that the road to the nearby summit be opened up as usual. The department capitulated to the demand only to be then faced with a similar demand from Denver in regard to the Mt. Evans road. Again the department capitulated, but its contention that the expenditure in both cases would not be warranted is borne out by the traffic figures. Less than 25 percent of the normal number of cars have used the mountain roads this year. The engineers regarded both requests as unjustified under the circumstances, but particularly so in regard to Pike's Peak which also is served by a cog railroad.

The bridge division has gone from steel to timber to concrete for structures as materials became scarce. War work in Colorado has created a local shortage in cement, which, coupled with the difficulties in obtaining reinforcing steel, has crippled bridge construction. Drainage likewise has been adversely affected. The department now is using clay-tile pipe, and even this material is short because of demands of war construction.

The state highway laboratory are being utilized almost full time by army projects in the area.

Little new construction

New construction this year has been confined largely to access roads serving the numerous war industries and camps in the state. One large project is the relocation of Route 24 west of Leadville around an army camp; at present the old road is closed. Another big job is grading and surfacing 140 miles in southwestern Colorado to serve important mines. A four-lane access road was built to one war plant in Denver, and plans are under way for similar route to another plant outside of the city.

Work has been suspended on the Clear Creek route between Denver and Idaho Springs, which has been under construction for several years only because of the insistence of the PRA. Mr. Vail regards the recently completed Mt. Vernon canyon route as adequate to take U. S. 40 through this section. Three of six necessary tunnels on the Clear Creek route are complete and in use on the section between Idaho Springs and Central City. Two more are holed through and a pilot heading has been driven through the sixth.

A pilot top heading, a mile long, is being driven under Loveland Pass for exploring the ground for a proposed highway tunnel that would cut out 4½ miles of heavy grade on U. S. 6. This stretch that reaches 12,000 ft. elevation is difficult to maintain and to keep open in the winter. The heading is more than half through at present, and bad ground has been encountered almost all the way.

Municipal Budgets Rise With Wartime Conditions

Two of every three cities in the country are spending more this year than in 1941 because of wartime budget increases for safety, health and sanitation activities, increased salaries and wages of employees, and reserve funds for emergencies, according to a survey made by the International City Managers' Association.

The survey of 185 cities in 32 states show also that only a few cities have developed new sources of revenue to meet the increasing costs, though many officials feel present revenues from local property taxes, state grants and other sources will decline to the point of bringing financial hardship.

Most cities do not anticipate any new or increased sources of revenue except as the increase in population may boost the revenue from water and electric utilities.

Of the 185 cities surveyed, 62 percent will spend more this year than in 1941, 30 percent will spend less and 8 percent will spend about the same. Main increases for 40 of the cities are in the fire and police departments, while 25 others say expenditures of all departments will go up. Other cities report increases for garbage collection and disposal, health service, street maintenance, civilian defense and water supply, in that order of frequency.

In more than one-third of the cities the increased expenditures are mainly for higher salaries and wages, another one-third—most of them over 25,000—have had to expand activities to meet demands of additional population, and most of the remaining cities have been forced into increased spending mainly on account of higher cost of supplies.

While the cities are forced to increase expenditures for some purposes, some of them are cutting down on other activities. Nearly one-half the municipalities with higher costs this year report such a move. Reductions are for relief and welfare expenditures—reported by 20 cities; street maintenance—12 cities; building inspection—five cities; and parks and recreation—three cities. Capital outlays have largely been discontinued, and some cities report no new equipment is being purchased.

About two-thirds of the cities reporting increased expenditures added one or more activities or services in 1942. These include civilian defense, airport operation, off-street parking lots, bus systems and recreation.

Low-Cost Decontamination Stations

GAS DECONTAMINATION STATIONS of a design so simple that they can be constructed for about $1,000 each (which includes concrete floors and plumbing) are soon to be built in Southern California for emergency protection in the event of a gas attack. Bids for the first nine stations, to be constructed as a trial, have been invited by the Los Angeles County Board of Supervisors.

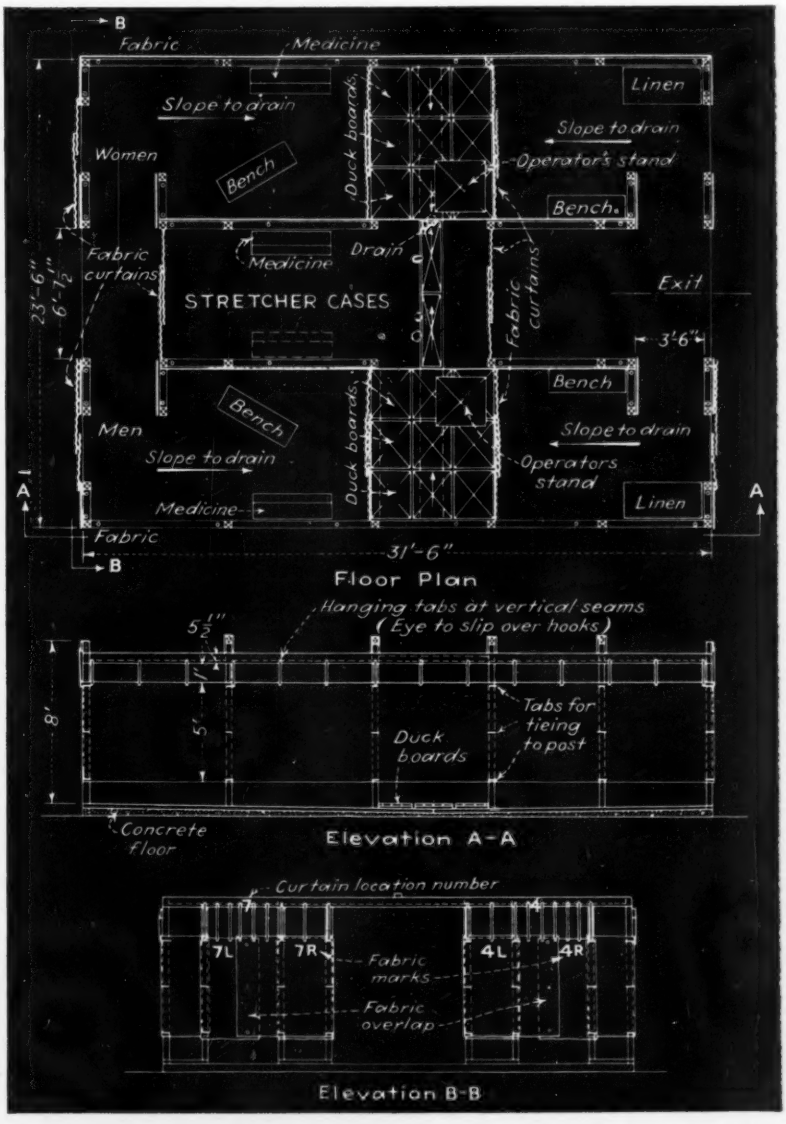
After completion of this first group, others to be constructed immediately, if plans now proposed are carried out, will provide more than 150 stations within the county. Of this number, 49 will be under county jurisdiction (in unincorporated territory), 55 in the city of Los Angeles and about 50 in small neighboring communities.

Crews for emergency service are now being trained. The plan is to have the complete organization for gas detection and for the handling of gas casualties trained and ready for service when the stations are available. More than 400 men are being organized and trained for this service, largely under the supervision of dentists selected with the aid of the Dental Association. The crew for each station includes 25 individuals who will work under the general direction of the medical officer in the nearby casualty station. The training includes special emphasis on gases of the Lewisite and mustard type.

General direction of all gas defense training is in the hands of selected members of the American Chemical Society. In more congested areas of the city itself, the gas officer in each district will be a chemist with necessary equipment for determining the kind of gas (and hence the proper treatment) should a gas attack occur.

The inexpensive decontamination stations, with principal features as shown in the drawing, consist of a collapsible timber framework set up on a concrete floor with walls and curtains made of fabric such as canvas. One of these stations is planned for each of the casualty stations throughout the area to be protected. The fundamental idea is that gas casualties shall first be taken through the decontamination station, thus avoiding risk to personnel (both staff and patients) in the regulation casualty station. A feature of the design is that stretcher cases move directly through the center aisle in a straight line. There are no corners to turn and if desirable, either of the other aisles may be used for the same purpose.

The station is purposely well ventilated; the canvas walls are a foot off the ground and the entire top is open. No roof is considered necessary as gas attacks are impracticable in damp weather. Oil lanterns will be used for station lighting and most of the plumbing fixtures that ordinarily would be required have been eliminated by providing a hand shower spray that is operated by an attend-



Arrangement of gas decontamination station built at a cost of $1,000. The station consists of a collapsible timber framework set up on a concrete floor with walls and curtains made of fabric.

ant as required. Warm water for lathering will be furnished in pails or cans and the lather is to be removed by the cold shower. Except for medical equipment, practically all of the furniture in the stations, including benches, tables, duck boards, etc., will be of field construction.

The concrete foundation, waste system, piping and timber framing are designed to be left permanently at the site. Detachable plumbing fixtures together with canvas partitions, curtains, furniture, lanterns, etc., will be stored in the nearby casualty station.

When an air raid alarm sounds or in the event of a blackout, the decontamination squads will go immediately to their assigned stations and set up the facilities as rapidly as possible. The canvas sides and curtains are all numbered and can be quickly hooked or tied in place with tabs. A little practice by the squad should make it possible to have the entire station assembled and ready for service in a very few minutes. After being used, the station and its equipment is to be cleaned, decontaminated and restored ready for future use.

Harold W. Kennedy is executive director of the Los Angeles County Defense Council; A. M. Rawn is senior gas officer. Separate but cooperating organizations have been set up in each city within the county.

In the city proper the program is to convert, for medical gas decontamination service, bath house facilities at public swimming pools and at junior and senior high school gymnasiums. The cost of converting these facilities plus the construction of twelve new units, thus providing 55 stations, will total $15,000 or $273 per station.

Emergency stations, where immediate relief can be made readily available to casualties, will be set up in gasoline service stations. Arrangements have been made with laundries for laundering contaminated but salvagable clothing by processes suited to the particular kind of gas being used and industries have been organized for decontaminating private equipment and buildings. The city is supplying each gas reconnaisance officer with a field bubbler testing outfit for identification of twelve gases. The cost of this equipment was $350 for 55 sets.

For the city of Los Angeles, H. A. van Norman is senior gas officer and R. F. Goudey is technical assistant.

Traffic Signal Blackout Units Of New Type Fill All Needs

TRAFFIC CONTROL signals of a type that would serve all day-and-night purposes for vehicular traffic, yet would not be markers for enemy airmen, have been sought by California's Division of Highways since the advent of the blackout era on the West Coast. A design that is believed to meet all requirements has been developed and ordered installed on all state highway signals in California.

When study of this problem began, the objectives set up were that the signal unit (1) should be of a type that could be easily and permanently installed, (2) would completely shield the light beam from enemy airmen at the same time that it (3) gave an adequate signal indication to traffic in daytime, as well as at night. Meeting these requirements would obviate the need for giving thought or attention to traffic light changes at times of blackout.

The design finally adopted, shown in the accompanying drawing, is little more than a modification of the standard type now in use. The unit is cylindrical, 8 in. in diameter and 6 in. long with three internal vanes. It is intended for use in the end of the 12-in. tunnel hoods that are extensively used on West Coast signal installations.

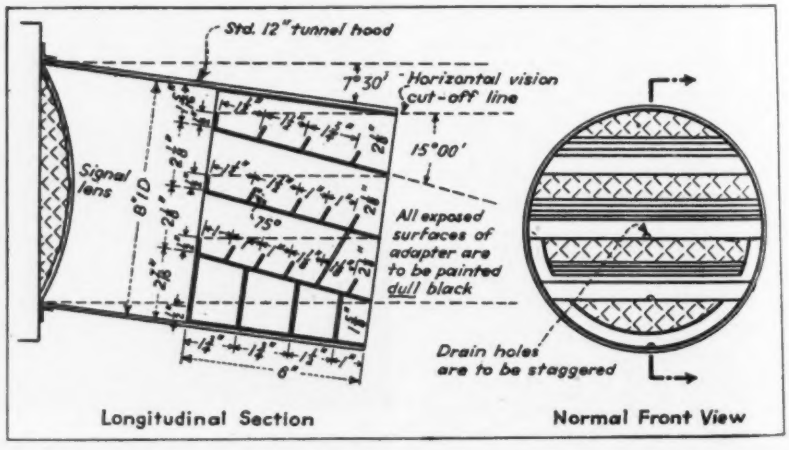
The vanes obstruct 40 percent of the lens area; the amount of lens area actually visible to traffic will depend upon the signal height and distance.

Each of the three vanes has fins on its upper surface that are of a height and spacing such that a series of shadows accomplish the desired screening or shielding purpose. Using a standard 60-watt traffic lamp at full brilliancy, when viewed 500 ft. from the signal, the signal light is cut off within a vertical distance of 5 ft.

The unit is designed for use in signal hoods having the standard downward tip of 7½ deg. Viewed from a distance there is very little restriction of the normal signal indication; most observers do not distinguish any reduction in intensity. At short range, the signal indication appears as three or four bands of light and they are rated as entirely adequate under both day and night conditions.

Tests of an installation were made by observers in a Navy blimp. The pilot's report includes the following:

"At ½ mi. and at 500 ft. altitude, a very dull red reflection became visible on the pavement. This red reflection, it is believed, would be invisible if the pavement were painted black at the intersection. With the amber light, at 500 ft. elevation, complete blackout conditions prevailed until ¼ mi. from the signal. At this distance, altitude was decreased to 300 ft. whence a dull amber reflection on the pavement became visible (at no time was light seen). Altitude was increased from 300 ft. to 500 ft. and the dull amber reflection disappeared and total darkness prevailed."



Longitudinal section and normal front view of the lens, hood and vanes that control the light beam.

Sewage Treatment to Meet War Needs

Contents in Brief—The variety of conditions to which the design of sewage treatment facilities must be adapted during wartime has given rise to a host of new problems. Solutions to some of these problems, and questions concerning others, were outlined by Samuel A. Greeley, consulting engineer of Chicago, before the American Public Works Association. The following is an extract from his statement.

THERE ARE GOOD REASONS for discussing new problems in sewage treatment, most of which are caused by the war. Experiences incident to preparing for and conducting the present war should be made of record for the future, including the problems, the difficulties, and the solutions. As war emergencies are of relatively short duration, the opportunity of learning how to meet them should be taken while possible.

Sewage treatment plants during these last two years have been used under a great variety of conditions. Chief among these applications are army camps, navy establishments, air fields, housing projects, and ordnance works. The first four applications are mainly for the treatment of domestic sewage; but some of the ordnance works have included the difficult problem of the disposal of the red and yellow waste waters from the manufacture of T.N.T. and the acid waste from smokeless powder.

In some cases, the rapid and large increases in the population of municipalities near war establishments have required additions to existing sewage treatment plants. In a few places, the expansion of waste-producing industries such as meat packing plants, has resulted in difficult problems of treatment plant enlargement and operation under heavy loads.

In time of war some things are more important than others. By way of illustration, the question may be asked as to a policy regarding the extent of sewage treatment. Shall this be limited to a complete control of contamination to protect health with a minimum of pollution control, or shall it be extended to provide a much greater degree of pollution control? Specifically, shall sewage treatment plants, wherever it is practicable, comprise sedimentation and chlorination or some similar partial treatment, leaving a tolerable residual nuisance pollution; or shall peacetime standards of complete protection of riparian rights be the guide, resulting in the use of more complete treatment processes such as trickling filters or activated sludge.

The answer to the question should conform to a general policy adopted with the understanding that any consequences of the policy will be supported. I have personally, from the beginning, favored the lesser degree of treatment as being more in harmony with the war effort in that it conserves material, equipment, and labor and permits earlier completion.

SOME MAJOR PROBLEMS

Among the major new problems resulting from the impact of the war upon sewage treatment, Mr. Greeley lists the following:

Limited operating experience with war projects to provide a basis for design.

Uncertainty as to the future use of the project and the load on the treatment plant.

Probable use of the project for a relatively short time.

Shortness of time available for design and construction.

Great shortage of many materials.

Difficulty of securing and organizing an adequate, qualified operating personnel and the effect of this on the design.

At the start of the present emergency in the fall of 1940, there was practically no direct information regarding the quantity and character of sewage from army and navy cantonments and barracks. A problem, therefore, was the estimating of these bases of design from other experience and data. The estimated quantity of 70 gal. per capita per day was found to be about right at many establishments having a personnel of some 20,000 or more. This estimate, however, has been found to be low in some of the smaller cantonments.

In the rapidly expanding war effort, it has been difficult to predict the population load for which capacity should be provided. Often appropriations do not include money for larger treatment plants to provide for an uncertain future increase in load. In municipal practice, the increase of population is generally gradual and a proper allowance for growth can be made. If the capacity of a camp is increased from 20,000 to 30,000 personnel, the load is added in very short order.

Further, the load varies considerably from time to time as from 30,000 at full occupation to perhaps 5,000 when troops are in the field. Can this "rest" period be weighed or used in setting basic design loads? Probably the design should provide for operation under much reduced loads as, for instance, to maintain sufficient velocities. Also, there are changing loads as war progresses, with less grease, less food, less water, and fewer facilities.

The likelihood that many of the projects recently built will be used only for the "duration"—possibly less than five years—results in many problems. Among these are questions of permanency of construction, the use of automatic or semi-automatic equipment, provisions in the design for salvage, the extent of the economical departure from the peace-time balance between first and operating costs, and the like.

Rapidity of design and construction is essential. The quality of the engineering work under such circumstances is bound to vary depending a good deal upon the experience of the engineer and the skill of his assistants. There has never been any problem regarding the willingness and ability of engineering staffs to work hard for long hours in the emergency. I

question however, whether an engineer, inexperienced in a special field, can prepare as good plans and specifications, under the pressure of the war emergency, as one familiar through intimate practice with work in the field of sewage treatment or water purification.

In my experience, a period of 100 to 120 days from the start of engineering work to the beginning of operation represents rapid construction for a sewage treatment or water treatment plant to serve some 30,000 troops.

Relation of operation to design

In municipal practice it often takes several months and sometimes a year or more after construction to establish an efficient operating routine and work out the "kinks." Sometimes the designing and supervising engineer is retained during these first months of operation. More often than not the plant starts with a load less than capacity. Trained operating personnel can be and often is assembled during the latter stages of construction and is prepared for operation with some understanding of the project.

In war-time practice, these procedures are difficult, if not impossible to obtain and result in another problem. What consideration should be given to this operating problem in the design? It may be suggested that the bases of design should be somewhat liberal to compensate for some difficulties in securing operating supervision and personnel of competence. This step, however, would increase the cost and the use of materials which is highly undesirable. In my opinion, disinfection by chlorination to control contamination should be provided on a liberal and flexible basis; but capacity of structures to control pollution, such as trickling filters should not be made larger solely on account of such possible operating shortcomings.

Problems in a typical project

In the design of a typical war project, questions occur somewhat as follows:

Having in mind the character of the waterway and the war emergency, what degree of treatment shall be provided?

As between several available sites for a sewage treatment plant, which will permit the most rapid construction?

To what extent shall basic capacities be increased to offset the uncertainties of war conditions?

To what extent shall the design provide for reducing the amount of reinforcing steel and other critical materials?

Can control of the banks of the stream be obtained at small cost so that some pollution may be deliberately envisaged?

As in all engineering problems, it is easy to be liberal, especially when funds are plentiful. Good engineering practice, however, requires that a conscientious effort be made to design with due regard to cost and, under present conditions, to the war effort. In my opinion, the expected short period of use and the need to conserve materials, justify some tolerance on the part of the public in the amount of residual pollution. There should, however, be no lowering of the standard in the matter of controlling contamination.

Meeting materials shortages

There is a great shortage of some materials used in the construction of sanitary engineering works, mainly various metals. Sewage treatment structures and even the processes themselves must be scrutinized in a new light, so that the desired results may be obtained with the materials now available.

Treatment plant structures lend themselves readily to construction methods that avoid the use of critical materials. This is demonstrated by many of the older plants, both here and in Europe, where tanks of one sort and another have been built of plain concrete or stone masonry and where successful operation has been carried on for many years without the use of the many types of mechanisms that have recently become commonplace.

Gravity concrete walls may be used for relatively shallow tanks, either rectangular or circular, while circular concrete caisson construction may be used for deeper tanks. Gravity wall construction has its best application in tanks extending above ground and the caisson construction where conditions are such as to produce external pressures higher than internal pressures. Caissons are particularly well suited for dry pits, such as pump chambers and operating manholes.

In general, savings in critical materials may be made by the use of heavy unreinforced concrete, elimination of mechanisms, substitution of wood for structural steel, use of wood or concrete troughs or conduits, or asbestos-cement, vitrified tile or plain concrete pipe, in place of metal pipe and reinforced concrete pipe, and use of wooden sluice gates, stop logs, and shear gates in place of valves or metal sluice gates.

Imhoff or two-story tanks that require no sludge removal mechanism and a minimum of sludge handling equipment, may be preferable to separate sludge digestion, particularly if constructed with circular units requiring little reinforcing steel. Baffles may be of wood.

For relatively complete treatment, trickling filters probably require less critical material than activated sludge plants, and where high rate filters can be used, the amount of critical material needed is relatively smaller.

An effective sewage treatment process that has been little used recently and which requires practically no critical materials, namely, intermittent sand filters, may be practicable in many cases, particularly where the soil is porous and space is readily available. With population loadings of 700 to 1,000 per acre, excellent results should be obtained even with little or no preliminary treatment. Sewage ponds may also be utilized effectively under certain conditions and a number of them are giving good results.

In the sterilization of sewage, the use of chlorinators, chlorine containers, and liquid chlorine, all of which are more or less critical, may be avoided by the use of calcium hypochlorite solution, mixed in wooden tanks and fed by means of orifice control devices.

Although during the war shipping shortages may create a high demand for dried sludge as fertilzer, the uncertainty of the war's duration may make it unwise to make large investments in materials and equipment to prepare this material for the market. From the standpoint of critical materials only, digestion in unheated tanks, followed by drying on open sand beds, is probably best, provided sufficient space is available. Where space is limited, and perhaps in any event, heated digestion is preferable with the sludge heated by introduction of steam directly into the sludge

entering the tank. This method eliminates heating coils, but requires the installation of a larger boiler.

Should the war continue for a long time, it may be necessary for the engineer to consider methods for recovering grease from sewage.

Waste from powder plants

Economical disposal of the red and yellow wastes from the manufacture of T.N.T. is a new problem. The color element is their most conspicuous characteristic. They are generally discharged from the works in dilutions of 1 to 250 or more of cooling water. In many cases, the color effect on the receiving waterway may be sufficiently controlled by decoloring with chlorine or by dilution with storage of the wastes during periods of low stream flow. In extreme cases, the only adequate answer may be evaporation of the wastes and incineration of the residue, which is very expensive.

New problems in sewage treatment clearly require the engineer to break away from the normal practices and habits of peacetime work. This is not an easy matter. But a successful answer to these new questions is a necessary and important contribution to the total war effort. It is a test of ability, which practicing engineers should welcome.

How to Salvage Tin Cans Effectively

Collection and salvage of tin cans by municipal authorities became mandatory on Nov. 4 in the states of California, Kansas, Missouri and Texas; it will become mandatory in 15 more states of the Northeastern Seaboard and the Middle West on Nov. 17. To aid municipal authorities in the latter states in determining just what is to be required of them, the following has been abstracted from a War Production Board memorandum to municipal governments in the four states covered by the initial order.

Supplementary Order M-72-a as amended places the responsibility for tin can collection squarely on the regular collectors of rubbish and waste, whether these collectors are cities, agents of cities, or private collectors. This was done in recognition of the fact that only such established collectors are able to salvage used tin cans on a systematic and continuous basis.

The general salvage section of the War Production Board is eager and willing to assist to the fullest extent in collecting all used tin cans. The general salvage manager in each of the regional offices of the War Production Board will be able to assist in many of the broader problems that may be faced. Within each region salvage chairmen have been appointed for each state, for each county, and for each large city. All of these officials stand ready to help the cities in this important conservation effort. A special representative of the War Production Board will call on you as soon as possible in connection with this program.

The collection of tin cans

The job of collecting the tin cans consists of picking them up from houses and commercial establishments, keeping them separate from other refuse, hauling them to a central point, and shipping or delivering them to a shredding plant or a copper precipitation plant. This job cannot be handled the same in all cities, because of great difference in collection equipment and methods, in existing separation practices, and in disposal systems. The most economical and the most practical plan for collecting, segregating and handling and shipping tin cans in your city can best be determined by your own refuse collection department.

It should be emphasized that the collection of tin cans is a regular process and that it should be planned and conducted on that basis.

It is suggested that the arrangements for tin can collections be as simple and direct as possible to avoid confusing householders as well as collection employees, and to reduce the amount of extra supervision required. The simplest plans provide for picking up the cans at the same time and at the same place some other class of refuse is collected. The cans may be placed in boxes, cartons, or baskets beside the regular refuse receptacle and ordinarily a collector will be able to carry both containers to the collection vehicle.

The control of private collectors or scavengers in your city may constitute a somewhat more difficult problem, not only in obtaining compliance with separation and collection requirements, but in shipping or hauling the collected cans to a shredding plant. It is desirable for your city to accept collected cans from private collectors at your central storage or shipping point.

If contractors are employed by municipalities to collect refuse which normally contains tin cans, special arrangements will undoubtedly have to be made. Under Supplementary Order M-72-a, as amended, such contractors are required to keep the cans separate, to collect them regularly, and to deliver them to a point designated by the municipal officials. Whether the contractor provides the loading, shipping, and hauling facilities and sells the cans to the copper precipitation or shredding companies or whether the municipality performs these functions is a matter of special agreement.

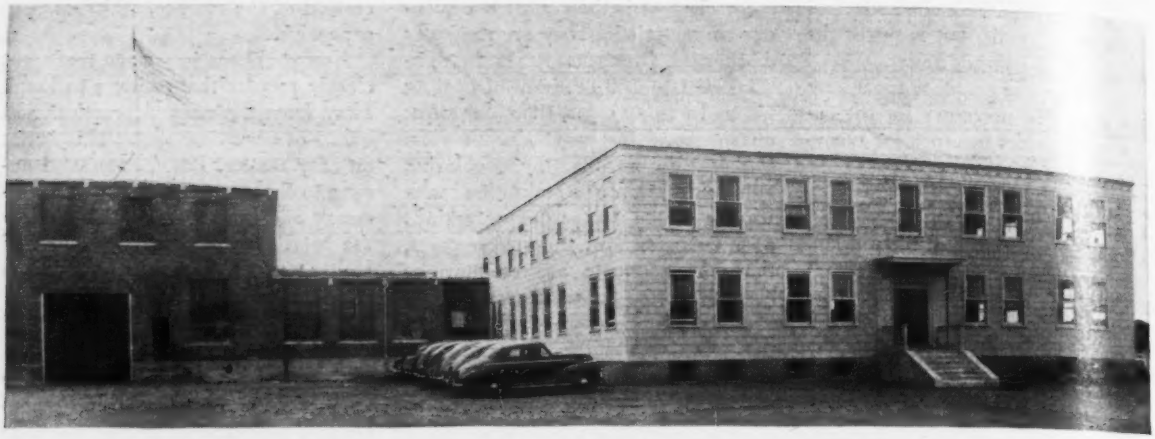
Cans may be effectively loaded into trucks by cranes equipped with electromagnets, or with clamshell or orange-peel buckets. Although coal loaders, snow loaders, or other conveyor-belt equipment may be used very successfully, it is somewhat slower than crane loading and usually requires a somewhat larger loading crew.

Preparation for shipment

Used cans do not have to be prepared in any way to be acceptable by shredding plants. The operation of shredding is a purely mechanical one and no chemical solutions are used.

From a public sanitation viewpoint, it is desirable to have the householders wash the cans and remove the ends from them so that when they are kept at community storage places or householders' back doors for extended periods, they cannot provide feeding or breeding places for flies, mosquitoes, and other insects.

Incinerated cans are acceptable for delivery to any one of the four shredding plants. Cans found in private incinerator residue are usable and should be segregated and placed for collection. Similarly, cans that inadvertently reach municipal incinerators and are burned should be separated from the ashes and taken to the community's central can storage point. Cans now on dumps may be collected and included with the shipments to shredding plants.



Front view of two-story plus basement structure, which was built at a cost of $60,928 and provides 13,000 sq. ft. of space.

Office Designed to Save Critical Materials

***Contents in Brief**—In preparing plans for a two-story and basement office building that had to be constructed quickly at a limited cost and from available materials, the U. S. Engineers chose a structure having a wood frame, except for the interior columns, which are steel shells filled with concrete. Construction of the building, providing 13,000 sq.ft. of floor area, was completed in 45 days. Final cost was $60,928 or approximately 42 c. per cu.ft.*

RAPID CONSTRUCTION with limited funds of a two-story and basement office building, providing 13,000 sq.ft. of floor space, was a recent war-program assignment of the Providence (R. I.) District, U. S. Engineers. Planned for workers at a war manufacturing plant, the building was to be designed and built in 70 days. Funds for construction were limited to $60,928. A semi-permanent structure of pleasing appearance was to be built with a minimum of critical materials. The basement was to be given over to a cafeteria, the first floor to a drafting room and the top floor to offices.

An L-shaped building with a 45x75-ft. front section and a 34x40-ft. wing was chosen. The design followed called for concrete basement, spread footings for the interior column foundations, and a wood frame, except for the interior columns, which were made of steel pipe filled with concrete. Asbestos shingles are used on the exposed side of the exterior walls and plywood and wallboard on the inside. Exception to this type of construction is a 12-in. brick wall enclosing a 14x24½-ft. vault having entrances on all three floors. The floors are concrete in the basement and vault and wood elsewhere. A 20-year tar-and-gravel roof completes the structure. Skill in the use of these materials to construct a building that should be serviceable for many years makes the project of interest.

In designing the building the wind load was assumed at 30 lb. per sq.ft. of exposed surface. Other design loads in lb. per sq.ft. were: snow load on the roof, 30; the floor live load, 75; and the floor dead load, 10.

Little reinforcing for foundations

The concrete exterior foundation wall, which is about 9 ft. high, was reinforced by two continuous ¾-in. dia. horizontal bars 3 in. from the bottom of the wall and two similar bars at about ground level or roughly 1 ft. below the windows. The horizontal steel was placed at these points to form a deep beam as well as to provide a continuous tie for the wall. No vertical reinforcement was used, since the soil pressure from the exterior fill was considered too small to require vertical reinforcement in the foundation walls. However, at each of the lower corners of the windows are two ¾-in. diagonal bars. This latter reinforcing was to prevent cracks from forming at the corners of the windows. In all only 1,851 lb. of horizontal steel was needed for this wall, which totaled 1,234 ft. in length and contained 91 cu.yd. of concrete. At the bottom of the wall parallel to the outer face a 4-in. dia. vitrified clay tile drain with open joints was installed. The drain is to prevent seepage into the building.

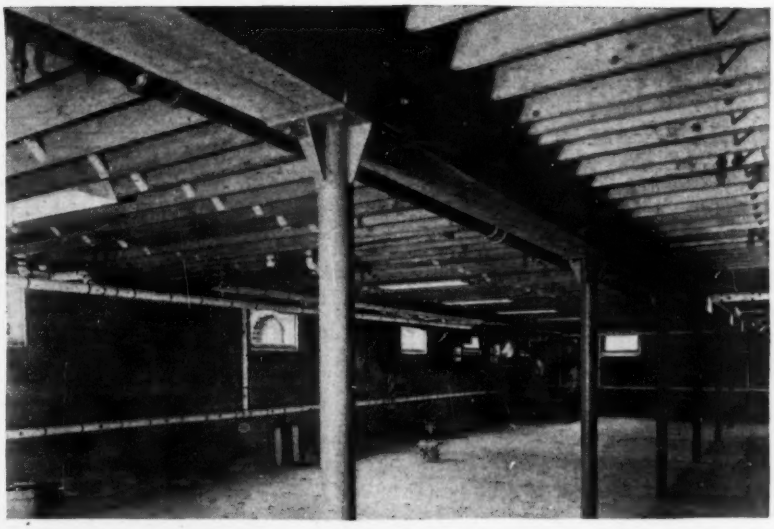
For most of the interior columns, which are not on an even spacing but are from 10 to 15 ft. apart, a 3½-ft. square block footing 1 ft. 2 in. high surmounted by a 2-ft. 2-in. square foundation stem of the same height was used. These footings were non-reinforced and the other footings were very similar, except the lower block was 4 ft. square and 1 ft. 4 in. thick, and the top 2½ ft. square and 1 ft. 4 in. high. Likewise, no reinforcing was used for the 4-in. concrete basement floor.

Because of their ease of installation and load-bearing capacity, ¼-in. thick steel pipes filled with concrete for added strength were used for the interior columns. These are of 4½ and 5-in. dia. in the basement, 3½ to 4½ in. on the first floor, and 3½ in. on the second or top floor. Although the columns change in size from floor to floor, they were made continuous from the basement to the ceiling. This arrangement was possible by welding a ½-in. thick bearing plate across the top of each basement column and similar plates at the top of the first-floor columns. The concrete-filled

columns are of a type widely used in the Providence area for low structures. They were delivered by the manufacturer with the concrete in place.

As shown by an accompanying photograph, the plates were made large enough to support a large fir beam at each transverse row of columns. Depending upon the span and whether for the first or second floor or the roof, these beams were 12x14 in., 10x14 in., or 10x12 in. Where the beams join the exterior basement wall a notch was built into the wall so that the beams rest directly on the concrete. The wall was not thickened at those points. The outer ends of the second-floor beams are supported by 6x10-in. fir columns and the outside ends of those for the roof by 4x10-in. posts.

The joists for the first floor consist of 2x12-in. fir members on 12-in. centers, for the second floor they were 2x12's on a 16-in. spacing, and for the roof 2x10's on 10-in. centers. Over the joists a 1x6-in. diagonal sheathing and a ¾-in. hardwood flooring with a 3-in. exposed face was added to complete the first and second floors. Exception to this arrangement is in a few of the offices and the toilets, which are on the first and second floors. In some of the offices linoleum has been added on top of the wood flooring, and in the toilets an asphaltic tile covers the concrete.



Most utilities enter the building at one corner of the basement and are distributed along the exterior foundation walls and below the first floor joists. Note plates welded to columns to support floorbeams and method of installing the pipes for the sprinkler system.

A major part of the second floor is given over to a large office. The wood framing is covered with wallboard and fluorescent lights are used.

Plywood and wallboard for walls

The joists and beams are left exposed in the basement but on the other floors a ½-in. wood fiber wallboard is added as a ceiling and the beams are enclosed in wallboard. In addition a 3-in. layer of rock wool insulation is added in the roof joists for better temperature control. The fluorescent lights, which are used throughout the building, are embedded in the ceiling flush with the lower edge of the joists.

In construction of the exterior walls between the wood columns previously mentioned 2x4-in. studs on 2-ft. centers are used and the asbestos shingles forming the outside covering are nailed over a 1-in. thick boarding. Inside for the first 3 ft. above floor level ¼-in. plywood covers the studs and above that level ½-in. wallboard is used. A 3-in. layer of rock wool was used between the studs for all the exterior walls, which are broken at frequent intervals by wood-frame windows. The resulting wall is considered very sturdy construction.

Construction of the partitions was by means of 2x4-in. studs on a 2-ft. spacing covered on both sides for the lower 3-ft. by ½-in. plywood and by ½-in. wallboard for the remaining height. Where sound-proof partitions were desired a 1-in. insulation was added inside as part of the wall. Use of this insulation was facilitated by increasing the partition's thickness by 1-in., and then placing the studs so that the insulation would pass between the wallboard and the studs first on one side of the wall and then the other.

The tar-and-gravel roof was built so as to drain toward the back side, and, in order to avoid the use of critical materials, wooden down spouts were used. These drains consist of 4-in. boxes made up of 1-in. material. Also a standard 5x7-in. wood gutter was specified for use on the roof.

All the utilities enter one corner of the building from a nearby structure. Many of the services are carried along the basement walls on brackets and then upward where needed. Heating is by steam, a radiator being located at the exterior wall below each window.

Final cost of the structure was $60,928 or approximately 42c. per cu.ft. of space enclosed. This cost includes planning and engineering, and construction of a driveway. For the Providence District, Col. H. S. Bishop, Jr., is district engineer and T. S. Burns, chief of the engineering division. Robert Logue was resident engineer on the job. Jenks & Ballou, Providence, was the architect, and E. Turgeon was the general contractor.

Determining Proportions of Concrete For Desired Compressive Strengths

A. T. Goldbeck and J. E. Gray
Engineering Director and Testing Engineer, Respectively, National Crushed Stone Association

***Contents in Brief**—Tables for rapid design of concrete mixes for various compressive strengths are made available. Use of the tables and the general design procedure are outlined in detail by solving a sample problem.*

COMPRESSIVE strengths of concrete mixtures made with different types of coarse aggregates of the same size will be essentially alike if these mixtures contain the same amount of cement and have the same consistency as measured by the slump test. Also, for practical purposes, the mixtures will have approximately the same degree of plasticity or workability when they contain the same volume of coarse aggregate, measured in a dry, rodded condition. Further, the volume of any plastic concrete is made up of the combined volumes of the solid portions of the component materials including the cement, aggregates and water. These are fundamental concepts in the present method for proportioning concrete.

By numerous tests on concrete containing typical aggregates, the correct amounts of coarse aggregate required for workability have been established for the general run of concrete mixes using sands of different gradations and coarse aggregates of different size ranges. The results of these tests are given in Table I in terms of the dry, rodded volume of coarse aggregate per unit volume of concrete. These volumes have been designated b/b_o, where b_o equals the solid volume of coarse aggregate in a unit volume of dry, rodded coarse aggregate and b is the solid volume of coarse aggregate in a unit volume of concrete.

Likewise, by means of tests, the relationships shown in Table II have been determined between 28-day compressive strength, consistency as measured by the slump test, total water required per cubic yard of concrete and size and type of coarse aggregate, whether angular, such as stone, or rounded, such as many gravels.

General design procedure

With the relationships given in Tables I and II it is a simple matter to determine the proper cement factor and total water content to produce concrete of a required consistency and 28-day compressive strength. Briefly, the general method consists of selecting from Table I the required amount of coarse aggregate and from Table II the necessary amounts of cement and water.

The solid volumes of the cement, coarse aggregate and water are then calculated in cu.ft. per cu.yd. of concrete. These solid volumes are added together and subtracted from 27 cu.ft. to obtain the solid volume of the sand. Finally, the solid volumes are converted to pounds merely by multiplying the respective solid volumes by the solid weights per cubic foot of the ingredients.

The method in detail is as follows:

1. Obtain by test, the bulk specific gravity of the cement and dry aggregates, gradation of aggregates, and dry, rodded weight per cu.ft. of coarse aggregate.

2. Calculate solid weights per cu.ft. of cement, dry sand and coarse aggregate (Sp.gr. $\times$ 62.4); also, solid volumes of one cu.ft. of cement (=0.48), and coarse aggregate (equals dry, rodded weight divided by solid weight per cu.ft.). Let b_o = solid volume of one cu.ft. of dry, rodded coarse aggregate.

3. From Table I, select appropriate value of b/b_o (dry, rodded volume of coarse aggregate per unit volume of concrete.) Then calculate $b = b/b_o \times b_o$ = solid volume of coarse aggregate per unit volume of concrete.

4. From Table II, select appropriate cement factor and total water per cu.yd. of concrete required for the type and size of coarse aggregate, strength and consistency desired.

5. Calculate solid volumes of cement, coarse aggregate and water; their sum subtracted from 27 cu.ft. equals the solid volume of sand per cu.yd. of concrete.

6. Convert the solid volumes into weights per cu.yd. of concrete.

7. Correct these weights of sand, coarse aggregate and water for moisture condition of the aggregates.

Example of calculations

The method can be clarified further by a simple problem. Thus, determine what the proportions of crushed stone

concrete should be to have a 28-day compressive strength of 3,000 psi. and a 3-in. slump when stone is angular coarse aggregate and the size of the stone is such that it passes a 1½-in. sieve and is retained on a No. 4 sieve.

For cement the specific gravity = 3.14; the solid weight = 3.14 × 62.4 = 196 lb. per cu.ft.; and the solid volume of a 94-lb. sack (one cu.ft.) = 94/196 = 0.48.

For the sand the fineness modulus, computed from gradation is 2.80; the bulk specific gravity = 2.65; and the solid weight = 2.65 × 62.4 = 165 lb. per cu.ft.

For the stone the bulk specific gravity = 2.70; the solid weight = 2.70 × 62.4 = 168 lb. per cu.ft.; the dry, rodded weight = 95 lb. per cu.ft., and the solid volume = 95/168 = 0.565 = b_o.

Cement, water and aggregate required

From Table II, the cement required = 4.9 sacks and the water = 36 gal. per cu.yd. of concrete. From Table I, $b/b_o = 0.70$, therefore $b = b/b_o \times b_o = 0.70 \times .565 = 0.396$ cu.ft.

The calculations for the correct proportions for one cubic yard of concrete are as follows:

Cement = 4.9 sacks × 0.48 = 2.35 cu.ft. (Solid volume)
Stone = $b \times 27 = 0.396 \times 27$ = 10.69 cu.ft. × 168 lb. = 1,796 lb.
Water = 36 gal./7.5 = 4.80 cu.ft.
Sand = 27 − (2.35 + 10.69 + 4.8) = 27 − 17.84 = 9.16 cu.ft. × 165 lb. = 1,511 lb.

If the sand is found to have four percent of free water and one percent absorption, the final weight of wet sand required is 1,511 + .05 × 1,511 = 1,511 + 76 = 1,587 lb. If the stone is surface dry and has low absorption, generally no correction in weight is necessary. The mixing water must be decreased by amount of free water on the sand. This amount = $\frac{.04 \times 1{,}511}{8.33}$ = 7.2 gal. Thus, the mixing water = 36 − 7.2 = 28.8 gal.

The final quantities are as follows: Cement, 4.9 sacks; sand, 1,587 lb., including four percent of free water and one percent absorbed water; stone, 1,796 lb. in surface dry condition; and water, 28.8 gal.

If the stone is dry and has one percent absorption, the additional mixing water required would be one percent of 1,796 = 18.0 lb. or 2.2 gal. and the total mixing water would then be 36 − 7.2 + 2.2 = 31.0 gal. Possibly slight adjustments in the above proportions will be necessary for the required consistency after the work is started, but if the preliminary tests and calculations have been made correctly, the adjustments will be of negligible amount.

Where designs are being prepared for a number of types of structures Table III will be helpful. This table gives satisfactory slumps, strengths, and coarse aggregate sizes for eight different general classes of work.

TABLE I. DRY, RODDED VOLUME OF COARSE AGGREGATE PER UNIT VOLUME OF CONCRETE (b/b_o)*

Size of coarse aggregate, square opening laboratory sieves	Fine sand		Medium sand			Coarse sand		
	Fineness modulus of sand							
	2.40	2.50	2.60	2.70	2.80	2.90	3.00	3.10
	Values for b/b_o							
#4 to ¾ in.	.71	.70	.69	.68	.67	.66	.65	.64
#4 to 1 in.	.72	.71	.70	.69	.68	.67	.66	.65
#4 to 1½ in.	.74	.73	.72	.71	.70	.69	.68	.67
#4 to 2 in.	.76	.75	.74	.73	.72	.71	.70	.69
#4 to 2½ in.	.78	.77	.76	.75	.74	.73	.72	.71

* b/b_o = dry, rodded volume of coarse aggregate per unit volume of concrete; b = solid volume of coarse aggregate per unit volume of concrete; and b_o = solid volume of coarse aggregate per unit volume of coarse aggregate.

Note: For concrete pavements or work in which there should be less mortar than required in the usual structural concrete, increase tabulated values of b/b_o about 10 percent. For concrete especially designed to be compacted by internal vibration under very rigid inspection, increase tabulated values of b/b_o about 15 percent.

TABLE II. CEMENT FACTORS (SACKS OF CEMENT PER CU. YD. OF CONCRETE) REQUIRED FOR 28-DAY COMPRESSIVE STRENGTHS LISTED

Size of coarse aggregate			#4 to ¾ in.		#4 to 1 in.		#4 to 1½ in.		#4 to 2 in.		#4 to 2½ in.	
Slump (in.)			3	6	3	6	3	6	3	6	3	6
Water, gal. per cu. yd. of concrete	Angular coarse aggregate		40	42	38	40	36	38	35	37	34	36
	Rounded coarse aggregate		36	38	34.5	36.5	33	35	32	34	31	33
28-day compressive strength lb. per sq. in.	2000	Sacks of cement per cu. yd. of concrete	4.6	4.9	4.4	4.6	4.2	4.4	4.1	4.3	4.0	4.2
	2500		5.0	5.3	4.8	5.0	4.5	4.8	4.4	4.6	4.3	4.5
	3000		5.5	5.8	5.2	5.5	4.9	5.2	4.8	5.1	4.7	4.9
	3500		6.0	6.3	5.7	6.0	5.4	5.7	5.2	5.5	5.1	5.4
	4000		6.5	6.8	6.1	6.5	5.8	6.1	5.7	6.0	5.5	5.8
	4500		7.1	7.4	6.7	7.1	6.3	6.7	6.2	6.5	6.0	6.3
	5000		7.7	8.1	7.3	7.7	6.9	7.3	6.8	7.1	6.5	6.9

Note: The 28-day strengths are the minimum values expected and should be used for design purposes. Laboratory specimens cured under ideal conditions will generally have higher strengths.

TABLE III. PROPERTIES OF CONCRETE HAVING SUITABLE STRENGTH AND DURABILITY FOR DIFFERENT CLASSES OF WORK

Slump (in.)	Size of coarse aggregate	Expected 28-day strength, psi.	Typical work for which recommended
2–3	#4 to 2½ #4 to 2	3000	Heavy sections, such as dams, foundations, walls.
3–6	#4 to 1 #4 to ¾	2500	Unexposed, reinforced-concrete beams and slabs.
2–3	#4 to 2	3500	Submerged concrete.
2–3	#4 to 2	4000	Structures under moderate exposure, concrete subject to intermittent wetting.
2–5	#4 to 1 #4 to 1½	3500 4000	Foundation walls, reservoirs, sewers, columns of buildings.
2–4	#4 to 1½	4500	Severe exposure at water-line.
3–6	#4 to ¾	4500	Very severe exposure of thin, reinforced sections.
3–6	#4 to 2	5000	Concrete for depositing under water.

Note: Use cement factors given in Table II.

Tank Built with Horizontal Staves

WOOD STAVES placed horizontally instead of in the usual vertical position, eliminated the need for steel bands around a tank 60 ft. in diameter and 9 ft. high recently built at Tacoma, Wash. The design was worked out in search of an oil storage structure that would require a minimum amount of steel. Not only does the new design provide storage capacity that can substitute for all-metal tanks in the 200,000-gal. size, but it fulfills this need with only one-third the steel required in standard wood tank construction using vertical staves and circumferential steel bands.

The new tank has a concrete base which carries anchors for the 4x6-in. vertical stiffeners spaced 10 ft. on centers around the circumference. After the concrete base was kept moist for a 14-day curing period, the inside vertical stiffeners were fastened in place with lagscrews and the horizontal staves forming the wall were bent around and clamped to the stiffeners. These staves, which are clear Douglas Fir, selected from stock at the mill and air dried to a moisture content of about 18 percent, were not affected by the lumber freeze order when this tank was built. The staves were cut from 20-ft. lengths of 2x6 stock, surfaced to $1\frac{5}{8}$ in. thickness and provided with tongue-and-groove joints. Joints between the end of staves were made with 1-in. scabs, $\frac{1}{2}$-in. bolts and $2\frac{1}{2}$-in. split-ring connectors, the number of rings varying with the depth and the consequent pressure. Splines were inserted between the staves to make the end joints watertight.

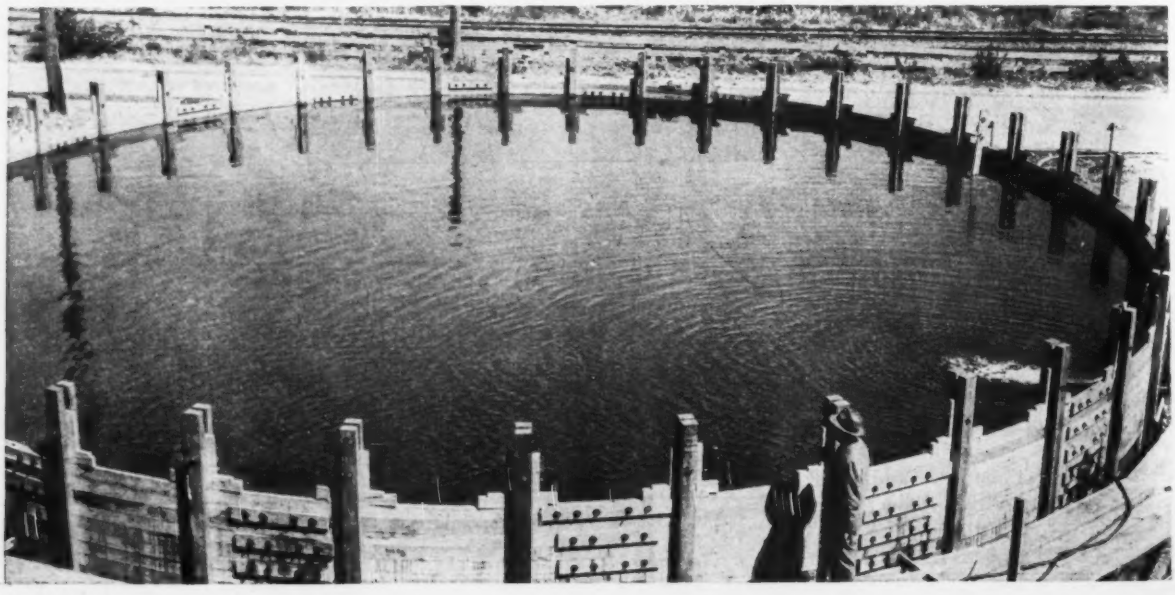
As each band was carried to a complete circle, stiffener clamps were released and the band was wedged against the next lower round. When all the horizontal staves were in place, outside vertical stiffeners were put on and the staves were fastened down to a tight fit by wedges driven into place under plates secured between each pair of stiffeners as shown in the illustration below. A mastic was poured into the inside of the bottom joint between the timber and concrete base and the outer edge of this joint between the timber and concrete base and the outer edge of this joint was grouted with 1 to 1 sand-cement grout hammered into place. Construction was carried out with only one carpenter supervising work done by common labor.

When first filled with no precautions against leakage, the quantity of leakage was not more than ordinarily occurs with a dry wooden tank on first filling. To hasten the tightening-up process, water was drawn off and the sides were wetted down for a day or two. When the tank was again filled it is said to have shown little leakage between the wood staves. Such leakage as did occur was largely through bolt holes. This could be materially reduced by use of tight fitting bolts and flexible washers. It is believed that an inner coating or lining would adapt the tank to storage of oil or gasoline.

The horizontal-stave design was developed by Harry R. Powell, structural engineer, for the Texaco Oil Co. Plans were checked by Professors B. L. Grondal and O. H. Shrader, Jr., of the University of Washington, and by C. J. Hogue and T. K. May, of the West Coast Lumbermen's Assn. The tank was constructed by and for the Henry Mill & Timber Co., S. Chas. Dearstyne, engineer, Tacoma, Wash.

Representatives of the U. S. Army Engineers, the Navy's Bureau of Yards and Docks, and the lumber industry met in Washington recently to determine if the horizontal wood stave tank as designed by Mr. Powell of Seattle is practical and adequate. It is reported that the design was accepted by the Army and the Navy, and that both organizations desired that further studies be made of ways and means to use the tank for oil and gasoline storage and for use under ground.

Use of horizontal staves in this tank resulted in a saving of two-thirds of the steel required for a vertical-stave tank.



Rotary or blower units work most efficiently if the snow is first windrowed with plows.

Fighting Snow to Keep 'Em Flying

***Contents in Brief**—Snow must not be permitted to aid the enemy to the extent of making our airports unusable at any time. Best practice to keep the fields open is to get the snow off and keep it off the runways at all times. Plows, windrowing the snow, followed by rotary blowers to spread it without establishing banks, are the generally preferred method of handling snow on airports. Clearing with plows alone can be made effective. Preparation of snow surfaces for skis and wheels is described.*

Hal W. Hunt
Assistant Editor, Engineering News-Record

CLEARING SNOW from airports assumes unusual importance this year as many new fields face their first test of winter operation. Heretofore, under extreme conditions, flying could be suspended, but this winter the runways must be kept continuously open to be ready for offensive or defensive action, and to keep the pilot training program in full operation. To assist in this essential part of the war effort, airport managers, airline officials, equipment manufacturers and representatives of the U. S. and Canadian governments were questioned as to practices that they recommend for effective, economical and efficient snow removal. The results of this survey are presented here for such value as they may have in keeping military and civilian airports in service through this vital winter.

Briefly, the consensus is that the one desirable method of handling snow on airports is to get it off, and keep it off, the runways at all times. In some places this is not practicable, and other means are employed, but complete removal of the snow is always desirable, as the one safe landing area for an airplane is

AN ENGINEERING NEWS-RECORD REPORT
NOVEMBER 5, 1942

The one-way blade delivers the snow to this rotary unit that has its power unit mounted on the plow.

a clean and clearly defined runway.

There are several ways of removing snow from runways, varying in speed, efficiency and cost, but the means most favored are machines that pick up the snow and deposit it well away from the used areas. This is usually done by plows, powered by high-tractive-effort trucks, working with rotary blowers or other snow throwing machines.

As a prelude to discussion of snow removal methods it should be stated that those familiar with snow handling are unanimous that the first requisite is adequate equipment. Some of this is special and expensive, but it is necessary for rapid and efficient snow removal from the huge areas of our major airports. Cost of equipment figured on an hours-used basis is exorbitant; cost figured as a proportion of the value of an airport is very low priced insurance against having the investment made useless for an indefinite period. In terms of aerial equipment, also, adequate snow handling machines are cheap; in peacetime a single "washout" may cost as much in repairs and downtime as the snow machines necessary to avert difficulties; and in time of war the value of always being able to get off the ground or land in an emergency cannot be estimated in dollars. The necessity and economy of complete snow removal is demonstrated by the fact that during last January and February at a Canadian training field 15 aircraft swerved off compacted runways. Damage amounted to as much as $15,000 on individual planes, with a total loss of $100,000. Officers at the field estimated that three-fourths of the damage would have been avoided if the runways had been cleared to provide a non-skid surface on which to land.

Snow-moving machines

A brief description of the snow-moving machines available will set the stage for the discussion of snow removal procedures that comprises the bulk of this report.

First in point of simplicity and use is the one-way plow, mounted on a medium-size truck and used to clear an area 6 to 8 ft. wide by throwing the snow to one side, usually the right of the truck. Such blades are good up to several inches of snow for a single pass such as is required to clear one side of a highway or opening swaths on an airport. When several such passes are made, as is necessary in clearing a wide runway, the snow builds up and the width of the cut must be reduced. Blades are designed to be most effective at certain speeds and as the snow piles up the speed possible with the unit is cut below that necessary to impart a rolling motion and it bogs down to just bulldozing the snow.

A heavier propelling unit is then indicated with a one-way or a V-plow designed to roll the snow at a lower speed. The V-plows are generally symmetrical about the centerline and are intended for making a first-cut opening of a drifted road. Offset V-plows, designed for widening roadway cuts and for airport use, are now available. They have blades 6 to 8 ft. long on the righthand side of the truck and only 3 or 4 ft. long on the left side to permit the unit to be used for cutting through a completely drifted area with more effectiveness than a one-way plow and yet be efficient for plowing on only one side. The center is mounted somewhat to one side of the truck centerline to distribute to the thrust evenly on the truck.

Various combinations of one-way plows, V-plows, and either one or two wings for pushing the snow farther out or for shaping the banks are available. The wings are usually about 3 ft. high and are so designed

that they can be raised and held at any height or angle desired or lowered to the pavement and used to widen the swath that can be cleared by a single passage of the plow.

The rotary or blower unit, very desirable for spreading-out the snow well back from the runways, generally has some means of breaking down banked snow and feeding it into rapidly rotating fans that throw the snow to one side with considerable velocity. In most machines the power for the snow blowing unit is supplied by a separate motor, usually located back of the cab to give better weight distribution and traction to the truck unit. Power is transmitted to the blower unit through universal joints and flexible drive devices, though this is avoided in some makes by mounting the engine on the same carriage with the plow, which is pushed ahead of the truck. Some machines combine the features of the plow and rotary unit by use of a one-way blade feeding to a single rotary blower or by a V-plow, or a double V-plow feeding two rotary blowers.

The rotary units now available for airport clearance are substantially the same machine designed for use on highways after several passes of a plow have built up a bank against which they work at a steady speed. Recently, to better meet the needs of airport clearance, some of the rotary units have been speeded up so they pick up and throw the snow while traveling at speeds up to 20 mph., and this has generally proven an advantage. Most of the rotary blowers remove a swath not more than 8 ft. wide and handling the shallow depths of a usual snowfall for this width does not feed sufficient snow for the machine to operate at its greatest efficiency. Plows can be used to supplement the rotary units by windrowing the snow. Some manufacturers have experimented with an angle blade on the machine, feeding into the rotary unit, to increase the swath width.

A recent development along this line combines a powerful motor truck with an offset V-front plow and a long wing into which is built a power-driven rotor. With this unit, snow is picked up by the plow and discharged along the wing by the powerful thrust of the truck, the rotor boosting the speed of discharge and helping to throw and disperse the snow. The faster the truck moves the greater the velocity of the snow as it approaches the rotor, which serves merely to increase its velocity without forcing it through an orifice or changing its direction of motion. This unit, to be effective, requires a truck with high tractive power and capable of sustained drive over a range of speeds.

Auxiliary machines

Crawler tractors with angle-dozer blades wiill be found useful for opening up areas and hauling or pushing equipment around. They may be especially desirable on military fields where it is necessary to get to dispersal pens with an easily maneuverable unit. A power-driven circular broom of the street cleaning type is useful to clear snow from the contact lights and to brush up the snow in particular areas after a plow has passed.

Some machines can be utilized for snow moving that are not designed or intended for the purpose but that happen to be nearby when an emergency arises. Availability of equipment and ingenuity of the operators are the only limits to the value of such borderline machines.

Patrol graders with earth-working blades have limited usefulness for airport snow removal as they are not designed to throw the snow. However, they are very useful for removing ice and for windrowing snow for subsequent handling by other means, and if a patrol unit is equipped with front-mounted plow, and possibly wings, it can be made into a powerful snow mover.

Another borderline machine is a carrying scraper, not recommended

QUICK HELPS ON SNOW REMOVAL

Get and keep your own snow removal equipment. If you depend on highway or municipal machines, chances are you won't have equipment when you need it.

Keep the snow off the runways. It has to come off some time, so keep it off currently.

Have your equipment overhauled and ready to go well in advance of expected snow season.

Turn the contact lights on day or night when snow starts. Their heat will prevent snow from covering and obscuring the lights.

Keep 150 ft. width of runway open and slope snow banks 3 ft. in 100 ft. for first class airports.

Rolling the snow outside the cleared area will help to prevent drifting.

Where plows are used alone, be sure to open a sufficient width on the first plowing to permit piling subsequent snow inside the banks.

If two speeds are available on rotary blowers use the slow speed on wet snow and high speed on dry snow.

Be sure that lights on the snow handling machines are high enough to clear the plows.

Have chains ready for all wheels of trucks or rubber-tired tractor units but don't use them until wheels begin to spin or side thrust develops.

Paint a contrasting stripe down the center of runways to guide pilots landing on low-visibility nights when the edges of runways may not be well defined.

Keep motive equipment in heated garages for care-free starting and maintenance.

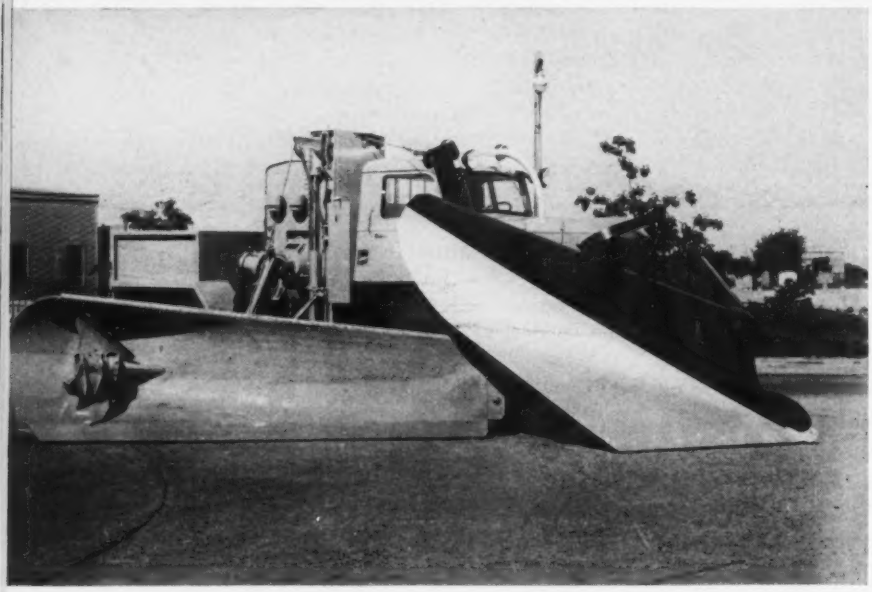
Paint machines to be used on the field a bright yellow or orange for daytime visibility. White or dark colors do not give sufficient contrast. Blinker lights are desirable at night.

Cutting blades will be hard to get this year for all types of snow moving machines. Old blades can be built up, and new ones given much longer life by welding a 1/8-in. dia. bead of nickel steel rod the full length of the blade and adding two successive beads of abrasive rod.

as an efficient snow moving unit but certainly capable of emergency service. No records of airport operations are available but it is suggested that the carriers be used with one or more patrol blades or plows to windrow the snow and shorten the travel necessary for loading the carrying unit. Snow must be well compacted to force itself into the bowl and positive ejection is necessary for discharge.

To illustrate the possible capabilities of the carrying-scraper unit, its operation on snow removal from streets might be cited. At Fargo, N. D., snow was pushed to the sides of the street until compacted banks 2 to 4 ft. high flanked each sidewalk. Under this snow was a layer of ice from 2 to 6 in. thick. A 12 cu.yd. scraper removed the snow and ice from an average 350 ft. long block each hour.

Two types of separate rotary units. The one above combines the advantages of plow and blower to clear a swath 15 ft. wide and boost the snow off the end of the wing. The machine below works best against a windrow of snow, and will move large banks piled up by other machines.



Besides clearing the actual runways, a considerable amount of other opening up must be done, as for example on taxiways, hangar entrances, walkways and approach highways. Plow and rotary equipment can be used, but may be supplemented by sidewalk width plows propelled by light tractors and by snow loaders and trucks for hauling snow out of the area around the buildings. Loading snow is not especially recommended as it is more economical to push it out of the way, if space can be found, and permit it to melt.

Continuous operation demanded

Whatever equipment is used, it should be of a proven type, designed for continuous operation. Operators express preference for trucks that drive on all wheels and state that they should be of a size comparable to the plows they must push. Such trucks should be equipped with special multi-speed transmission, as the snow-moving units are most efficient when the truck speed can be adjusted to the optimum speed for snow handling. Speed is essential for snow handling with plows as they throw the snow best at the maximum speed at which they can be operated constantly. Rotary blowers are governed to one or two speeds, hence the truck travel must be adjusted closely to keep snow always at the intake but never choking the engine or stalling the truck. For propelling rotary plows there is no substitute for adequate power as a machine operated at full throttle cannot be depended on for 24-a-day service. Heavy-duty rather than automotive power units are desirable, and they should never be operated faster than the manufacturer's recommended speed.

As an illustration of what equipment may be called upon to do, experience at the Moncton, N. B., airport may be cited. The total fall of snow through the winter was 113 in. of which 52 in. fell in January. Keeping the runways open during the month required that a tractor hauling rollers be operated 453 hr., a rotary blower 412 hr., and a plow 386 hr. In one period the tractor operated 12 days, the rotary 8 days, and the plow 9 days with only service stops. Men and machines must be in good condition to stand such work in extreme cold and stormy weather.

Snow removal truck operators are

Big banks, such as these built up on the Montpelier, Vt., airport cannot easily be moved, hence it is essential that piles be started far enough out from the runway edge to make it possible for later snow to be piled in front of them.

generally agreed that single tires are best for this work. The use of single tires of the same size on all wheels not only conserves rubber but also relieves excessive differential action in the driving mechanism, thus prolonging the life of the truck. Closely spaced tire chains, rather than the more common emergency type of tire chain, should be available for all the wheels of the truck or tractor unit. These will give maximum traction with minimum slippage and least damage to tire equipment, but should not be put on until conditions are such that wheel spin or troublesome side thrust develops.

Be ready when snow starts to fall

In fighting snow it is important to be ready for it when the snowfall starts. Equipment, therefore, should be put in the best possible shape well in advance of the snow season with frames and controls for plows installed ready for quick attachment of the actual plowing unit.

The machines available, the expected rate and duration of snowfall and whether the snow is fluffy and dry governs the time snow removal should start. Weather reports should be carefully studied so that personnel will be on hand when needed and so that plans can be made for clearing snow from the runways that lie in the direction of the wind as soon as the snow becomes deep enough to be troublesome. Removal or other processing of snow must be started in conformity with the storm and continued until the snow is under control without regard to shifts or to 40-hour-week limitations.

If the snow is dry and fluffy, and not drifting, a transport type plane can land safely in as much as 6 to 8 in. of snow. This amount will not retard the speed at which snow removal units may operate, nor will it be a menace to operation of moderate sized planes, as in emergencies they have landed in 18 in. of soft snow. If the snow is moist and the expected fall is heavy, removal should start when the depth is only 2 or 3 in., to avoid building up to greater depths before clearing can be completed. Aircraft equipped with high pressure tires are capable of operating from airports having considerably more soft snow on the surface than can planes equipped with airwheels due to the larger tire area of the latter and the resulting greater resistance.

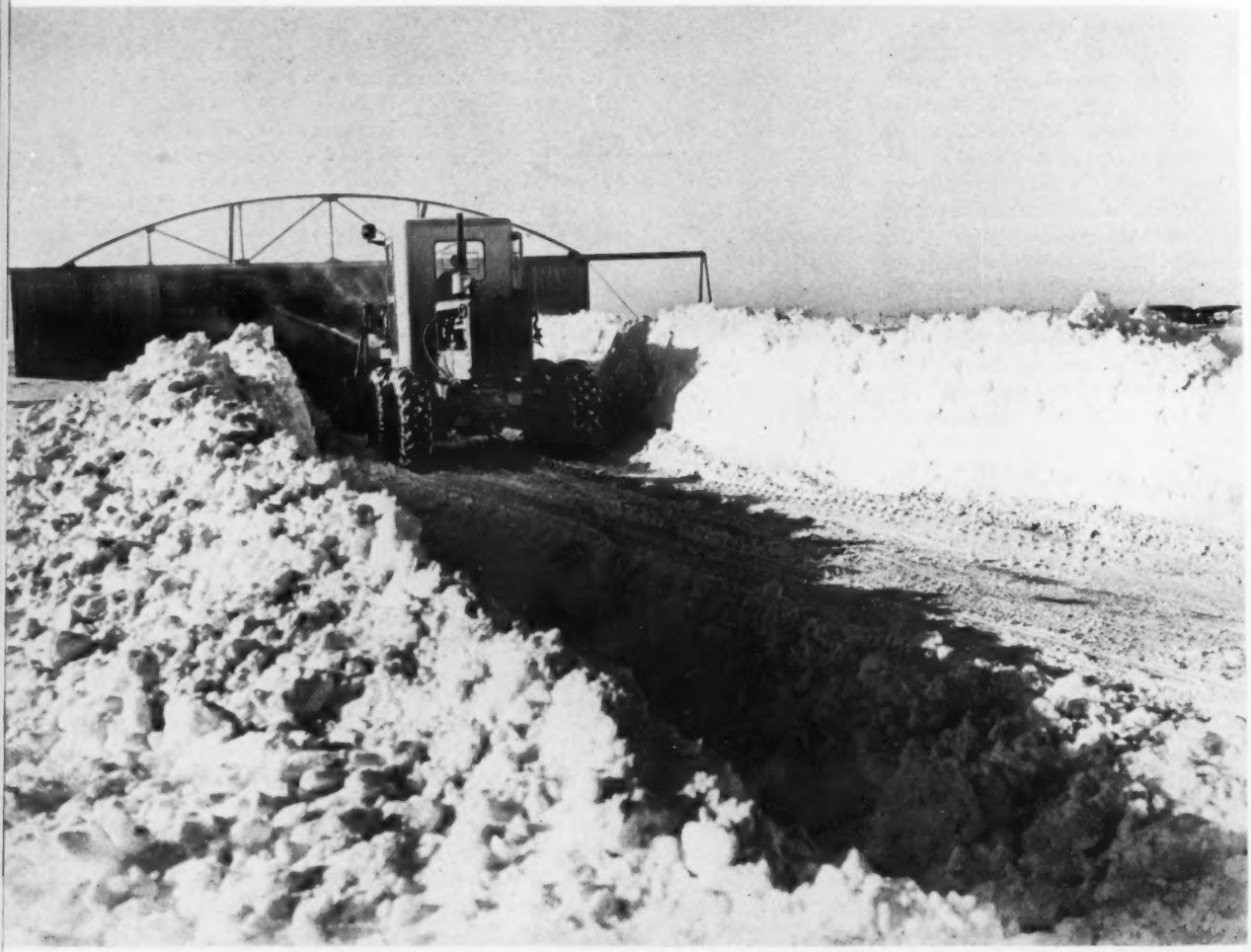
Clearing with plows and blowers

Probably the most desirable method of clearing snow from airports is use of plows and rotary blowers together. When adequate equipment is available the usual procedure is to build up a windrow with the plow and then blow it off the landing areas with the rotary unit. The size of the windrow is determined by the size with which the available rotary works best, as some of them are designed for slow speed operation against a large bank and others for more rapid movement in medium depth snow. As soon as a windrow is built up so the plows slow down, the blower unit should go into operation. When there is little wind, or when the wind is straight down the runway, clearing should begin at the center and the snow moved to each side. In a strong cross-wind clearing should start on the windward side and the snow carried entirely across the area to be opened. Rotary units will throw the snow 50 to 90 ft. with, or 40 ft. against, a moderate wind, but it is almost useless to attempt to blow snow into a storm.

The first runway should be cleared by successive passes of the equipment for the runway's full length with no attention given to the fact that snow is being deposited on other runways at the intersections. After the first runway is made usable, the next to be cleared is the one indicated by the weather reports as in the probable direction to which the wind will change. Lacking this information, a runway about at right angles to the first should be cleared.

Snow should be cleared to the full width of the runway and to beyond the contact lights, usually just a few feet outside paved runway areas. Subsequently, as convenient, it should be cleared to some greater

What it takes to clear an airport. High speed truck with one-way plow pushes snow to one side until windrow becomes large; heavier truck with wing then takes over, and finally a rotary unit is used to spread the snow, eliminating banks. Runways should be cleared to a width of 150 ft. Vertical edges, or banks even outside this area, should be avoided if possible to minimize trapping of blowing snow and damage to planes out of control.



A motor-patrol grader with front mounted V-plow has the traction and power necessary to cut through the heaviest drifts. Wings are available for most machines of this type and the regular underbody maintenance blade is useful for clearing packed snow and ice. Graders without the regular snow-plow blades windrow snow ahead of a rotary plow.

width depending on expected snow fall during the season. Equipment should not be operated over turf areas outside the runways when the ground is soft and there is not sufficient snow to prevent machines breaking through. Banks at the edge of the cleared area should be sloped to a rise of not more than 3 ft. in 100 ft. if possible. This plan will reduce damage to planes running off the runway and prevent forming traps for drifting snow.

A cleared width of runway of 150 ft. is desirable but, where snowfall is heavy and moist and removal is difficult, 125 ft. will generally be found a safe minimum for transport type planes. It is advisable, however, to clear to as great a width as possible in the early part of the season to keep down banks that will build up on either side of the cleared area if the total fall of snow is heavy during the winter.

Where the runways intersect at oblique angles excess snow is bound to accumulate in the V formed between the runways. Methods of disposing of this snow differ, but the simplest seems to be to shift the deflectors on the rotary plows to throw snow away from the cleared runway. Usually this procedure must be supplemented by added maneuvering including some diagonal cuts and backing to throw the snow out of the V. Rotary plows can sometimes be most effectively operated in successively widening circles at the intersections. Occasionally it may be necessary to throw the snow farther back on the unpaved area to provide a place to dispose of succeeding snowfalls. The angle of intersection, depth of snow and velocity and direction of the wind will dictate the procedure necessary at a particular intersection.

Clearing with plows alone

Successful clearing of airports with plows alone requires an understanding of the limitations of various plow units. Airport snow removal is totally different from highway plowing as the snow must be carried a long distance, often in a cross-wind, and high banks must be avoided.

It has been found in actual plowing operation that no one piece of equipment will do the complete job efficiently. Long experience on the municipally owned Montpelier, Vt., airport, where the average snowfall has been 105 in. per year, has resulted in the use of three distinctly different types of plows. Clearing here has been done under an annual contract by the Vermont Road Equipment Co.

The physical conditions of this port have recently been changed but until this summer, the port had two runways, one north and south, the other northeast and southwest. The runways were 2,600 and 2,400 ft. long, with 100 ft. width of mixed-in-place surface and with grass covered safety strips 100 ft. wide on each side.

The plan for winter operation at this field is to maintain a cleared strip at least 200 ft. wide at all times. To make this possible, early plowing is done to a total width of 350 ft., and after banks are once established, each successive fall of snow is plowed against these banks. Plowing usually is started when the depth of snow reaches 2 in., and is continued as necessary until all snow is off the runway.

Operations are started with a 1½-ton truck equipped with a 7-ft. one-way blade with deflecting moldboard. The first trip is made in the center of the runway and the snow pushed to each side. By narrowing the width of the cuts on each trip it is possible to keep up the truck speed and to handle the increased volume of snow as it piles up. The 100 ft. wide hard-surfaced area is usually cleared in nine round trips, the truck being operated at from 20 to 25 mph. depending on the density of the snow. It has not been found practical to do much plowing with the light truck off the hard surfaced area.

The next operation is use of a similar but larger one-way plow to widen the cleared area on the turf landing strip outside the pavement. This plow is mounted on a 3-ton, rear-drive truck, which has a single, right-hand, rear-mounted 8-ft. wide leveling wing. The first cut made is about 5 ft. wide with the wing raised on an angle from 6 in. on the inside to 8 or 10 in. at the outer end. The action of the wing in this position is to disperse snow with very little added draft on the truck. This unit is operated at a speed of 15 to 20 mph. and can be used efficiently for a width of about 50 ft.

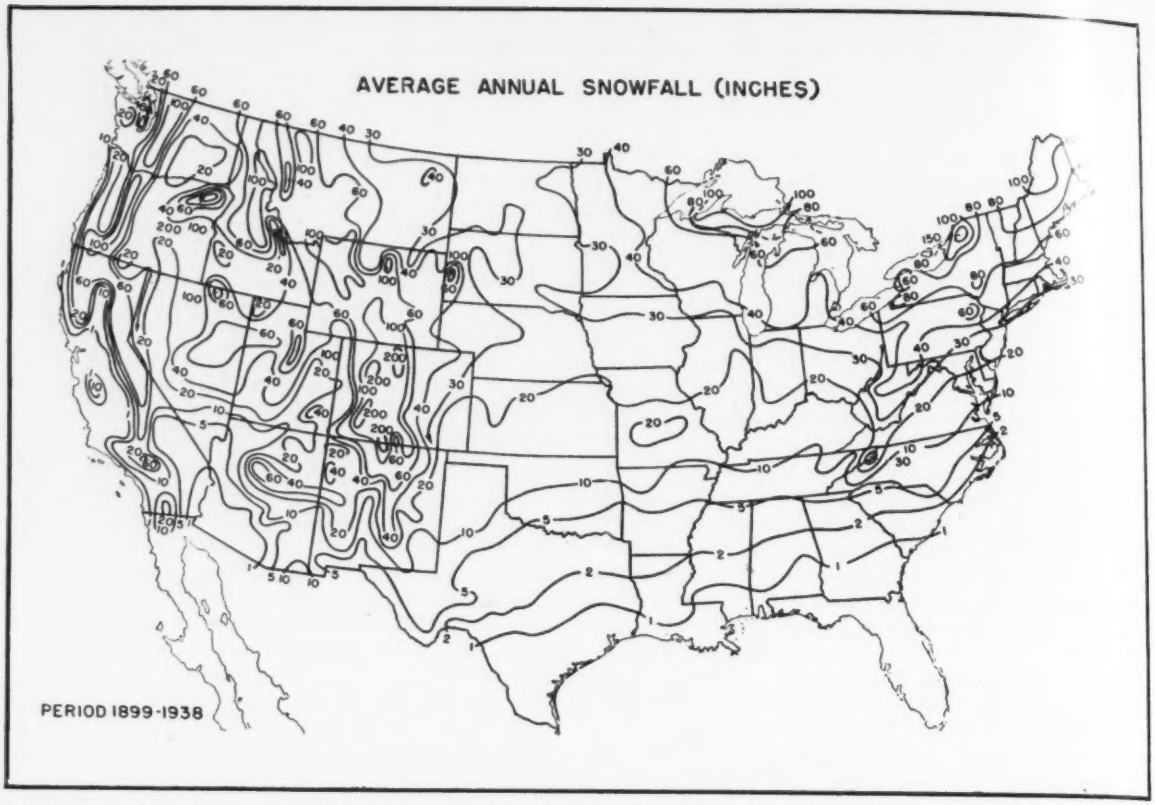
To move the accumulation of snow from this plowing, a heavy-duty V-plow is employed with a right-hand front-mounted, high-lift, leveling wing mounted on an all-wheel-drive truck. Only half of the nose of the plow is used in making a cut about 4 ft. wide with the wing raised from the ground to a position where a full wing load is carried at all times. Speed of the truck on the first cut is from 10 to 12 mph., but a reduction of speed is necessary on each trip since more snow has to be handled.

The procedure followed at intersections of runways where a sharp V is formed is to make successive thrusts straight into the snow with the big truck and V-plow. The snow is carried back to a spoil area between the runways, a cleared depth of from 300 to 400 ft. being desirable. The light truck is used to clean up the spill from the V-plow on the runways and at intersections.

Banks are usually from 6 to 8 ft. deep after each plowing and before settlement takes place. It is practically impossible to widen the runways further once the snow has been permitted to settle. Thus, it is essential that a sufficient width of open area be established in the first plowing to assure that the desired runway width will not be encroached upon despite unusually heavy falls of snow during any winter.

Ice on runways

Snow should be cleared as close to the surface as possible. Sliding shoes or casters supporting the blades can be adjusted to permit clearing right down to the surface of a smooth runway. Any remaining snow is usually blown off by propeller blasts or melted by the heat of the ground or the sun. Along the seacoast, however, ice may be expected to form from packed snow, sleet or from light rain freezing as it falls. This ice can sometimes be removed by underbody blades on trucks or by blades on patrol graders, but this is a time-consuming operation where the ice area is extensive. Also, care must be used to guard against damaging the airport surface with the treads of tractors, cutting blades or plows. If the surface seal is broken, water getting to the subgrade may freeze and cause heaving of areas on the runways. Some clearing units have a safety trip on the blade that releases when it gouges into the surface or strikes obstructions, thus reducing the damage to the machine and to the paving.



Average snowfall over a period of years is not a safe indication of the snow-handling problem. In an area indicated as having 80 in. annual snowfall, 21 inches of snow fell in 22 hours last winter.

Rather than clearing ice by mechanical means, abrasive material is often used to skidproof the affected areas. Sand, applied with the spinning spreader used on highways, is a preferred means of skidproofing. Spreading units fit into the rear of a truck body, often those used for snow removal, and have a powered centrifugal spreader that casts the sand over a moderate width. The units generally available are those developed to spread only over a two-lane highway and will require extra trips for airport use.

It is advantageous to use hot sand as the particles embed themselves in the surface and thus resist propeller blasts and wind. Asphalt dryers have proved satisfactory for preparing the sand and are quite often available in the winter when their normal use is suspended. At one airport, heated sand is secured from a commercial concreting plant, but in case of necessity it can be heated over a long pipe in which a fire is built. A serious difficulty in use of sand is freezing of the stock piles. This condition may be alleviated by keeping the piles covered, but the covering must be done before cold weather.

Although commercial airlines have not generally favored the use of chemicals, which have a tendency to cause oxidation and rusting when splashed on the planes, the Civil Aeronautics Authority and the army air force authorize the use of calcium or sodium chloride for clearing runways of ice on airports under their jurisdiction. Suggested methods is to mix 50 to 75 lbs. per cu. yd. with up to $\frac{3}{8}$-in. abrasive material, making the chloride into a brine and treating the material as it is put into storage piles at the airport for winter use. Cinders and sharp, coarse sand are the preferred abrasive materials. It is expected that flake chloride will be added as the material is loaded for use, depending on ice thickness, atmospheric and temperature conditions. Rate of application to the runway surface should be 1 to $1\frac{1}{2}$ lb. per sq. yd. of the abrasive material.

SURFACES FOR SKIS AND WHEELS

Snow surfaces are made and maintained on some airports to provide landing surfaces for both wheels and skis, but more generally just to reduce the cost of winter operation. Such surfaces can be maintained reasonably well away from the coast where the snow is fairly damp when it falls and yet temperatures are consistently low. In coastal area where rainfall may occur and the snow is wet and slushy, it will be found difficult, if not impossible, to maintain snow surfaces, and removal of the snow will be found the only alternative.

The general attitude of those directly connected with winter maintenance is that if a reasonable amount of equipment can be secured a surface suitable for year-round wheel landing can be kept open and skis need not be used. However, both ski and wheel-equipped planes may be expected to use some of the same ports. The technique used for snow handling at such ports differs from that where compaction is employed to save moving the snow.

Prescribed practice on such airports under supervision of the Cana-

dian Department of Transport is to build up and then maintain through the winter a uniform layer of 5-in. well compacted snow and ice. The equipment required for such operations are a snow roller, a drag, a scarifier and crawler type tractor (pneumatic tired tractors are useful for the first rolling, but are unsatisfactory in heavy snow). To remove excess snow from the compacted area a one-way plow, possibly with wing attachment, the power units such as an all-wheel-drive truck or high-speed tractor for operation of the plow, and a rotary blower mounted on a truck unit are required.

Rollers are usually 3 to 5 ft. dia. corrugated sheet metal, often just a piece of culvert pipe with interior spreaders, a hub and tongue. A bank of three such rollers drawn by a single hauling unit will speed the work. Corrugated surfaces have been found to produce better compaction than a smooth surface as lights and shadows from the corrugations reduce glare and make visibility much better for the pilot.

Ordinarily the rollers are built lighter than may be required under certain snow conditions, with provisions made to load the roller when extra weight is required. Even weight distribution can be obtained by use of uniformly filled bags of sand (50 lb. is suggested for ease in handling).

Angle iron drags are usually made with three steel angles set perpendicular to the direction of motion and mounted on a frame that makes their height adjustable. Where snow is drifted into mounds the drags are used to spread it into an even surface ahead of the rollers. Under conditions of 4 to 12-in. snow in high wind the drag may be used to work the air out of the snow and lower it. The drags are usually made to the buyer's design and have scarifier teeth attached to a separately adjustable bar to cut into the ice. Angle irons may also be attached to the frame of the roller, being made adjustable to smooth and regulate the snow passing to the rollers and thus securing a more uniform surface and in many cases making the use of the separate drag unnecessary. A spike-tooth harrow may often be desirable to prepare previously rolled surfaces for leveling and compacting. Best position for using the harrow is hooked in tandem between the tractor and the rollers.

Only a moist snow can be successfully compacted into a really good runway surface. Dry and sandy snow cannot be packed with any degree of safety. It may be possible to develop a substantial crust on the surface which appears to be able to support large aircraft, yet it will be found that flaws and soft spots will almost always remain which constitute a menace to landing aircraft. Dry, fluffy snow is practically impossible to pack, and it will be found necessary to remove such snow from the runways until suitable snow falls. When the season, temperature and probable fall of snow indicate that a time has been reached that a snow surface can be maintained, rolling should be started.

First rolling most important

The initial compaction is by far the most important step in obtaining a satisfactory surface. The first operation forms the foundation for the runway structure and cements the snow firmly to the runway and the ground. It should commence when there is 2 in. of suitable snow on the runway (4 in. will compact to about 1 in. of thickness), and continue until 5 in. of solid compacted snow and ice have been produced for the full width of the hard-surfaced area. With a layer of less than 5 in. there is a possibility of breaking through to the hard surface during a prolonged mild period after which the sun's heat on the bare spots will accelerate the thawing action. This may cause flooding, and subsequent freezing will produce irregular glare ice that makes brakes useless and the surface unsafe for either skis or wheels. If more than 5-in thickness of compacted snow and ice is permitted to accumulate, drainage and other difficulties will be serious at the spring break-up. Hence, added snow should be disposed of by removing it as it falls. If this is not possible, the snow should be compacted by rolling temporarily and then scarifying the surface and removing it as convenient.

It is desirable to provide ample space to operate the equipment around the contact lights and to prevent snow from obscuring the lights and building up too deeply over the drain catchbasins. Beyond the solidly compacted area the snow should be feathered back, dragged and rolled to the width of the boundary lights to provide extra space should aircraft overrun the site, or over or undershoot the runway.

Soft spots or holes on the runways caused by midwinter thaws may be lightly scarified with a harrow so that the whole surface will be made uniform. Care must be exercised in use of the harrows that the surface is not cut too deeply and chunks are not left on the runway to freeze before the final rolling is completed. If there is a possibility that lower temperatures will occur before the surface is made smooth, resulting in frozen lumps, the operation should be carried out progressively in small areas.

A properly compacted surface does not usually honeycomb during the period of the spring thaw, like ice on a lake, provided it is properly worked during the thawing period. Such compaction should usually be done in the late afternoon so that the surface will be smooth before it refreezes during the night. Particular attention should be paid to temperature forecasts as there will be times when the temperature will remain above freezing through the night and no work should be done on the ports at such times.

By keeping the whole surface of the airport smooth, it will be found that under high wind conditions certain falls of snow will be carried entirely off the field. Also, the evaporation of snow under the sun's direct

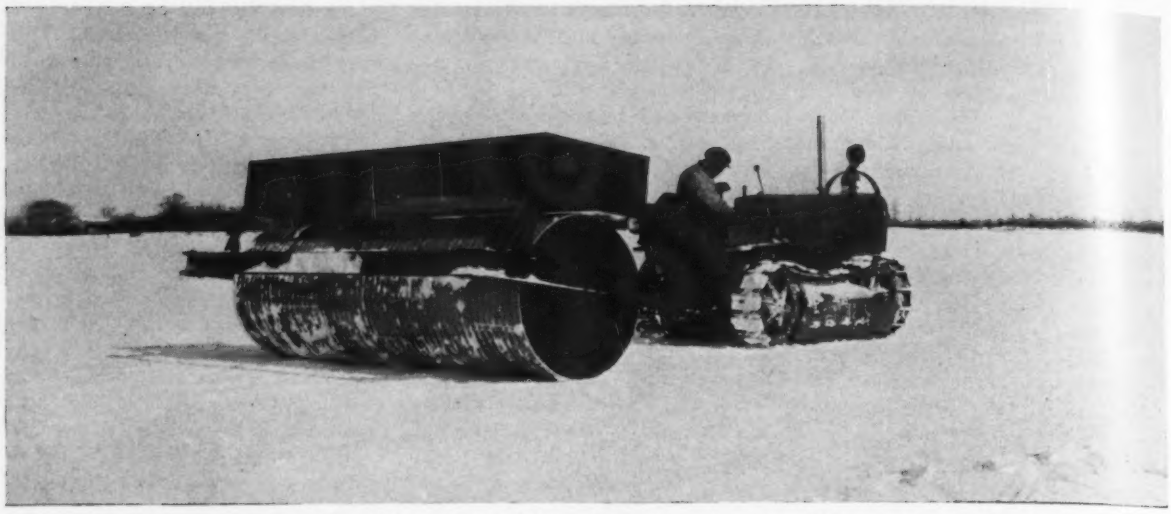
IF SNOW SURFACES ARE TO BE USED

Watch out for oil spots. The dark color absorbs heat from the sun, causes a soft spot below.

Mark the landing area clearly. Evergreen trees 6 ft. high at the corners and 3 ft. high near the boundary lights, but not obscuring them, are satisfactory. Black flags 18 in. square on a wooden staff 4 ft. long 5/8 in. sq. fill the same function. Set them erect and see that they are frozen into the snow.

Mark bad spots in snow with red flags by day, red lanterns or "bomb" flares by night.

Scarify and reroll after each thaw as soon as freezing starts. This assures a satisfactory surface.



Rollers generally are used in banks of three, instead of as shown, to get greater efficiency from hauling equipment. The box is designed to carry added weight.

rays is greater and will be more even if the entire surface is smooth. For this reason, if time permits, the whole of the airport surface should be rolled and dragged.

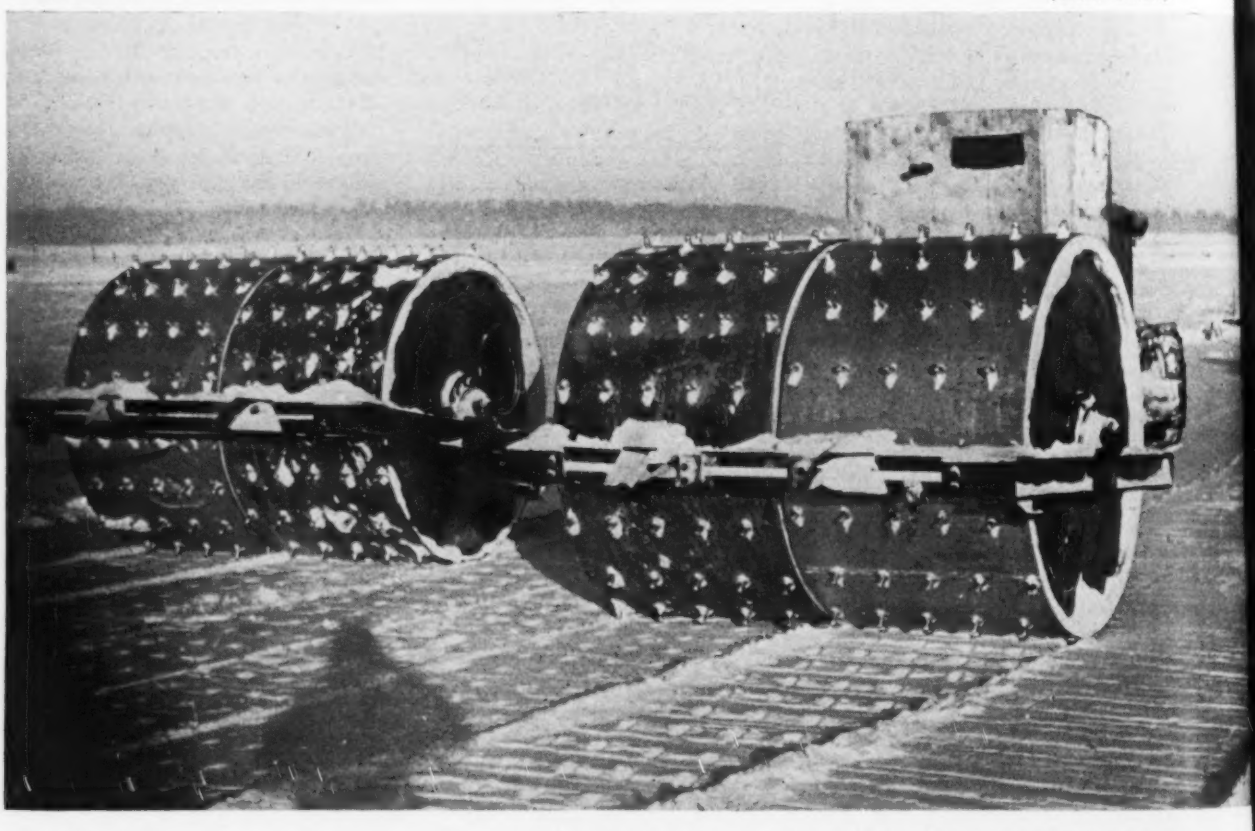
Proper sequence for such operations is first to clear the paved width of the runway to a little beyond the contact lights. Next the landing strips to their full width, or to at least 500 ft., should be rolled and brought to a firm surface and finally, the remainder of the field should be rolled.

How to prevent snow sticking

Above 21 deg. F. snow is very likely to stick to the rollers and the grouser shoes of the hauling tractor. As the temperature is seldom as low as 21 deg. during a snowfall and often for several hours thereafter, preparation of the surface may be seriously delayed. A coat of shellac helps greatly in preventing snow sticking to the rollers. Another effective method is to use a saline solution

Snow compaction on a Russian airport. Rollers are preceded by drag units (right) to level the snow. The value of the "sheepsfoot" action of the roller at the left is not known, but it is probable that it compacts the lower material much as in an earthfill.

(Credit Sovfoto)



applied to the rollers while in operation. The solution found most effective is made with 7 lb. of salt mixed into 5 gal. of hot water. It is applied by saturating floor matting with the solution and placing the mats so they are in constant contact with the roller. The 5 gal. of salt water are adequate for a 10-ft. wide roller for 20 hours.

Mild weather and rain may cause the surface to become soft, rough and uneven. In this event a scarifier attached to the front blade of a drag can be used to level the surface as soon as the surface has been frozen hard. There is not much value in attempting to level the surface when the snow is soft, and scarifying may have to be done in the middle of the night when it is coldest. When the compacted surface has been reduced to 2 in., there is little danger of wheeled craft being damaged should it break through to the bare runway, but if it is reduced much below 2 in. there may be danger in landing with skis.

Compaction instead of removal

When considerable snow can be expected to fall and stay on the ground all winter, with few if any thaws, compaction of all the snow that falls has been used on many of the airports in Canada and elsewhere to reduce the expense of winter maintenance of runways. During the cold weather this method is fairly satisfactory and reasonably safe. When the spring thaws occur it causes difficulties and may require suspension of operations during the break-up and until the port can be completely cleared.

The plan is not to attempt to remove the snow at any time during the winter, but to compact successive snowfalls so that planes land on a paving of snow or what may eventually become ice. The surface may thus be continuously raised throughout the period of snowfall. The depth of snow will be lowered somewhat throughout the winter as some is carried away by the wind and evaporated through the action of the sun rays even during the coldest weather.

The equipment necessary for rolling is similar to that described for the first operations on a port intended for both ski and wheel landings: a crawler type tractor, an adjustable angle-iron drag and a roller or bank of rollers of large diameter. Extensions must be provided to raise the contact lights above the snow surface and these must be continually adjusted through the snow season.

Again the initial compaction is the most important step in cementing the snow firmly to the runway and the ground. If the snow is not more than 3 or 4 in. deep, the first treatment will usually consist of rolling. Subsequently, if the surface is uneven, it should be dragged and again rolled. It is essential that the field be rolled after rises of temperature, but otherwise it should not be rolled except after a snowfall as too much working has a tendency to break up the snow and make it fluffy.

Drags vs. rollers

Alaskan procedure on preparing and maintaining snow surfaces is substantially different from that described as Canadian practice, perhaps due to the different characteristics of the snow. The drags used are of heavy timbers and planking with a flat bottom surface and the forward edge turned up. It is desirable, though not necessary, to have the bottom surface covered with a fairly heavy iron plate. Size of the drag depends upon the type of vehicle to be used for propulsion, and provision is usually made for sacks of sand or other weights to be placed on the drag to create sufficient weight

for good packing characteristics. On runways where snow tends to drift, a cutter plank is desirable ahead of the dragging surface so that the drifts may first be leveled and then packed to avoid a rolling surface. Dragging with the proper equipment has proven the most efficient method of field maintenance, with the exception of actual snow removal, according to our Alaskan informant.

Helps for the operator

Many small devices and schemes can be used to make snow removal easier and operation of the machines safer and easier. Controls for plows, wings and other facilities attached to the trucks should be of a mechanical type that permit making any changes regularly necessary without leaving the cab. A powerful spotlight should be supplied and regular lights mounted on the top of the cab or some other high point since those on the truck may be blocked by the equipment. Cabs of machines should be tight so that they can be kept warm by a heater.

Satisfactory operation of snow-handling machines on clearing or compacting will be greatly enhanced if it is possible to keep in constant contact with the operators. Two-way radio communication with the airport control tower is desirable, and receiving equipment in the truck is essential. Safe operation demands that the equipment on the runways be under control from the tower, and it is helpful when acknowledgment of orders can be made and frequent reports given on the runway condition especially at night during a snowstorm. Where several pieces of equipment are in use it is satisfactory to have communication with a supervisor's car only if it can be used for continuous contact with all equipment. On one municipally-owned port where radio equipment for the trucks was not used, an expedient of a police car with two-way radio was employed. This was not entirely satisfactory, however, as the police car could not communicate directly with the tower, it being necessary to relay messages through the police station.

SNOW HANDLING MACHINES

A description of modern snow-handling machines, plows, rotaries, truck, loaders, sanders, and others—will be found in the "New Aids to the Constructor" columns of this issue starting on p. 117.

A reprint of this article, together with the data on snow-handling machines, is to be made. Copies can be obtained from the editorial offices, 330 W. 42nd St., New York. Price ten cents.

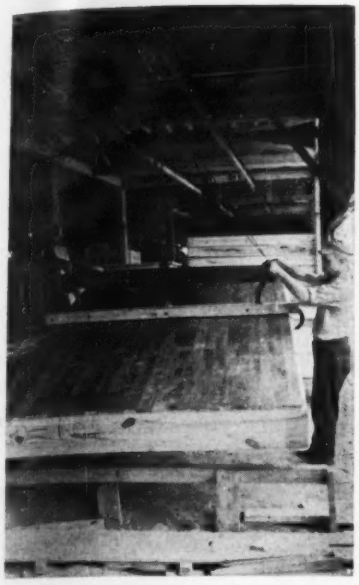
Heated storage should be provided for the motive equipment used on airport clearing. The big machines use heavy lubricants when they are to be operated at full-rated speed for many hours. Such lubricants make the engines very hard to start when cold and may become so stiff that they do not protect close-fitting parts when cold. Also, use for snow removal causes the machines to become coated with snow and ice that must be thawed before they can be properly serviced.

Personnel is a most important item in winter airport maintenance. Ordinarily one man can actually operate the machine, but it is good policy to have an extra man on it to help with the unexpected things that may occur. The men must be familiar with the machines and, even more important, with the field. There is no substitute for experience in knowing what a machine will do, how to make minor repairs, or where to go in a blinding snowstorm. Most snow removal is done by men working on 12-hr. shifts as the work is not continuous enough to justify having three shifts of trained workers. In nearly all cases the men have an "esprit de corps" that is just as loyal, just as efficient and dependable as any pilots, and they will work any hours to get the airport in shape for its intended use. They can be depended on to "Keep 'Em Flying."

Rotary units will handle large concentrations of snow after other machines have piled it up.

From Field and Office

WORKING PROBLEMS AND TIME-SAVING METHODS FOR ENGINEERS AND CONTRACTORS



TROLLEY HOIST SAVES LABOR

An overhead trolley hoist used to pick up sections of the pre-assembled floors saved labor on a demountable defense housing job. A special hitch for picking up the load is practically automatic in operation and the prongs grasp the sides of the piece to avoid marring the pre-finished floors. The hoist is electric powered but is pushed manually along the trolley.

This device is being used by Barrett & Hilp, contractors, on a 5,000-unit defense housing project near the Norfolk, Va., Navy Yard.

Air Compressors Speed Water Department Maintenance

Of the 23 one-ton repair trucks operated by the San Francisco Water Department, 13 are now equipped with small air compressors, capacity 65 cu. ft. free air per minute; receiver pressure 125 psi. The compressors have more than paid for themselves and have been applied to numerous uses not even contemplated when this plan of operation was inaugurated.

Before these small compressors were put on, the department used five trucks built exclusively for handling a 120-cu.ft. compressor driven by a gasoline engine. Whenever any pavement cutting had to be done, one of these trucks would be sent out. Meantime, while it was en route to the job, the crew already at the site usually had to be idle awaiting its arrival.

With the advent of the compressor outfit on the regular repair truck, the number of these large air compressor units has been reduced from five to two and the calls for them have been decreased in even higher ratio.

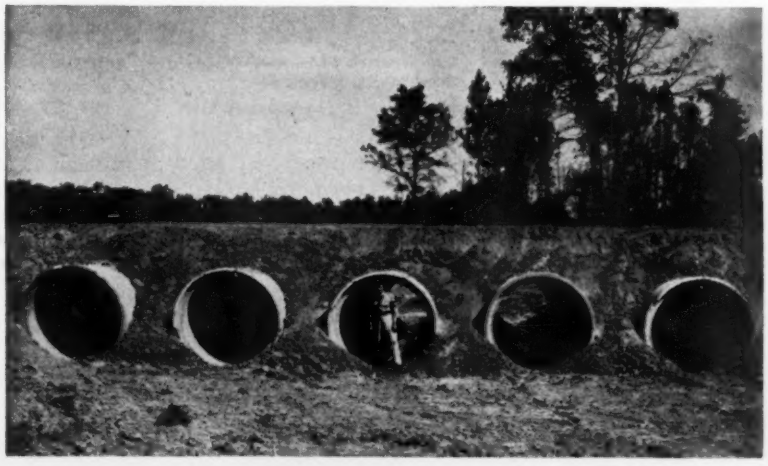
In addition to the great advantage of saving time while the compressor unit is being brought out, it has been found that the small compressor on the repair trucks is frequently of great advantage in other operations than pavement cutting, previously performed by other means. For example: (1) the air pressure is used to operate a pneumatic hammer for driving a pipe under pavement; (2) when making taps into large mains, the compressed air is used for operating the drill, thus saving hand labor; and (3) frequently the stoppage in a service line can be forced back into the main by connecting the air pressure to the service and then opening the connection so that a "shot" of the compressed air will force the water (and often any obstruction) back into the larger main.

Concrete Pipe Speeds Bridge Job

Rather than wait for a priority rating for construction of a 36-ft. long wooden trestle on a railroad to an airbase, the Nashville District, U. S. Engineers, built five parallel 72-in. dia., reinforced-concrete culverts from pipe sections left over from the drainage work on another nearby air field. As a result the job was completed in a few days and far ahead of schedule.

Each culvert was made up of nine 4-ft. long pipe sections with 7-in. thick walls and tongue-and-groove joints. A 3-ft. clearance between adjacent culverts was used and the pipe sections were placed on a 6-in. thick gravel bed. The backfill was added in 6-in., hand-tamped layers until 2 ft. above the top of the pipe, after which a small bulldozer was used for spreading and compacting the remainder of the fill. A 4-ft. earth cover over the pipes was employed. In three days a seven-man crew was able to install the pipe sections and add the backfill.

Although a 625-ft. ditch was needed downstream to lower the pipe sufficiently for the 4-ft. cover, a big time saving resulted and the cost of the culverts was less than the wood trestle would have been. A reduction in maintenance can also be expected.



Use of left-over 72-in. dia. pipe sections from a nearby job resulted in rapid construction of this railroad crossing, which might otherwise have caused a delay due to the difficulty of obtaining materials.

PAPER PERMITS PILING SALVAGE

On a bridge job, special cellular paper liners of the type shown in the above photograph have been successfully used to eliminate bond between the concrete of the footings and the steel sheet-piling of the enclosing cofferdam. As a result, the piling was readily pulled after the foundations were completed. The cellular paper liners were developed by Maurice Deutsch, consulting engineer, New York City.

Moment and Deflection Formulas

The solution presented by Joshua Tabatchnik for finding the bending moment with concentrated loads evenly spaced on a simple beam (*ENR* April 23, 1942, p. 627) can be extended to obtain additional useful design formulas. The problem is a prismatic beam carrying a total load P that is divided into n equal concentrations at equal spacings. As given by Mr. Tabatchnik, the maximum moment in a simple beam is given, when n is odd, by $M_{max} = \frac{PL}{8}\frac{(n+1)}{n}$ and when n is even by $M_{max} = \frac{PL}{8}\frac{(n+2)}{(n+1)}$.

The following additional formulas also are readily obtainable. The maximum slope of a simple beam is given by $\Theta_{max} = \frac{PL^2}{24\,EI}\frac{(n+2)}{(n+1)}$ whether n is odd or even. The maximum deflection of a simple beam is given when n is odd by $\Delta_{max} = \frac{PL^3}{384\,EI}\frac{(5n^2+10n+1}{(n+1)}$, and when n is even by $\Delta_{max} =$

$$\frac{PL^3}{384\,EI}\frac{(n+2)\,(5\,n^2+10n+6)}{(n+1)^3}$$

It is also desirable to have the values of maximum moment and deflection for the fixed-end beam, particularly for indeterminate structure analysis. The maximum moment for the fixed-end condition, which is the negative end moment, is given for when n is odd or even by $M_{max} = \frac{PL}{12}\left(\frac{n+2}{n+1}\right)$. The maximum deflection for the fixed-end beam may be obtained when n is odd by $\Delta_{max} = \frac{PL^3}{384\,EI}\frac{(n+1)}{n}$ and when n is even by $\Delta_{max} =$

$$\frac{PL^3}{384\,EI}\frac{(n+2)\,(n^2+2n+2)}{(n+1)^3}$$

Since the majority of the formulas contain the factor $n + 1$, it should be apparent that a slight simplification of the formulas could be brought about by substituting $n + 1 = k$, where k is the number of spaces.—STANLEY U. BENSCOTER, *U. S. Engineers Office, Vicksburg, Miss.*

Guy Anchorage Made from Pipe

Setting up derricks or masts on construction work frequently does not justify the expense of burying dead men or the installation of elaborate anchorages for the guys. One Texas contractor found that a heavy pipe, driven into the ground as a hitch, could be made vastly more effective if a short spud or arm of heavy pipe was welded to the member at such an angle as to be in line with the guy and approximately level with the ground when the pipe was driven. A short heavy timber placed under the supporting arm overcomes the tendency of the post to tilt and pull forward, since the pressure on the arm as the post tends to rise causes the board to compact the soil even more firmly around the post.

A good anchor for guys may be made quickly and cheaply from pipe welded as shown above.

During extremely wet seasons a second post, driven a few feet behind the main anchorage, may be used to distribute the pull over more terrain if the tops of the two posts are tied together with a short loop of wire line.

Anchorages such as those described may be retrieved intact after the job is done. Also they do not offer permanent hazard, even when used in roadway or open space.—CHARLES C. LYNDE, *Houston, Texas.*

Split Hitch Snubs Vibration

Where rhythmic impulses are transmitted to the guy lines by operation of the derrick or mast which they support, the forces traveling along the wire to the hitch often impose on the anchor a greater strain than any met in ordinary lifting operations. Also the summation of such impulses tends to work the post gradually toward the vertical, or even to pull it from the ground.

One Texas contractor solved this problem by using two stakes or posts instead of the single one usually employed. Turnbuckles attached to each stake were used to tie to the terminal loop in the guy wire, the stakes being so set that one turnbuckle was three inches or more longer than the other. This inequality of the two branches of the guy at the ground level snubbed the swaying of the line in a vertical plane and effectively wiped out the effect of the waves transmitted to the guy by the hoisting unit.

The dual hitch maintained full guy support throughout the job and no resetting or installation of a buried anchor was necessary—CHARLES C. LYNDE, *Houston, Texas.*

The vibration in the guy to a derrick was snubbed by this double hitch.

Book Notes and Reviews

The month's addition to the engineer's reading and reference list

An Aid to Calculators

NATURAL TRIGONOMETRIC FUNCTIONS TO SEVEN DECIMAL PLACES FOR EVERY TEN SECONDS OF ARC—Second Edition. By Howard Chapin Ives. 351 pp. John Wiley & Sons, New York; Chapman & Hall, London, $9.

The second edition of this book, designed especially for those who use calculating machines in making their computations, has been expanded by the addition of a new table on the tangents and cotangents of angles from zero to two degrees to single seconds. This was done because of the rapid change in the tangents and cotangents of small angles.

For Diversion

LEONARDO: MASTER OF RENAISSANCE—By Elizabeth Hubbard Lansing. 237 pp. Thomas Y. Crowell Co., New York. $2.75.

For those who would like to forget the problems of today for an evening or two, this book is recommended. Written as a biography, the author skillfully provides a background of places and people against which to display the known record of that remarkable man who, at about the time this country was discovered, conceived and actually made rough models of many things such as the airplane that did not become realities until centuries after his death. The book is an interesting record of the life of one of the world's earliest known engineers, Leonardo da Vinci.

Industrial Waste Guides

INDUSTRIAL WASTE GUIDES—SUPPLEMENT "D", Ohio River Pollution Survey, Final Report to the Ohio River Committee—Issued by U. S. Public Health Service, Cincinnati, Ohio. (Limited distribution.)

One of the important phases of the Ohio River Pollution Survey, a joint undertaking of the U. S. Public Health Service and the Corps of Engineers, completed recently, was a study of industrial wastes. This led to the preparation of "guides" or pamphlets, in which is summarized information on sources, quantities and character of wastes, pollution effects and remedial measures for eleven principal types of industrial waste found in the Ohio Basin.

Bound together in a single volume (known as Supplement D to the final Ohio River Pollution Survey Report), these guides constitute a reference work of exceptional merit, the value of which will be enhanced when postwar stream pollution remedial work is to be undertaken. Unfortunately the supply of the complete supplement is limited, but copies of the separate guides can be obtained. Inquiries may be directed to M. Le Bosquet, Jr., senior public health engineer in charge at Cincinnati.

About Many Subjects

HANDBOOK OF APPLIED HYDRAULICS—Calvin V. Davis, editor-in-chief. 1,085 pp. McGraw-Hill Book Co., New York & London. $7.50.

Nearly a decade ago, when Calvin Davis proposed preparation of a book of the scope of the present one many of those whom he consulted discouraged him because of the magnitude of such an undertaking. Undaunted he went about getting authors for the several sections into which he proposed to divide the book. Now the projected book has become a reality.

Any attempt to appraise such a comprehensive work within the space available in these pages is quite out of the question. A measure of its scope and authority, however, is given by a listing of the sections and participating authors. Hydraulic Formulas, W. L. Voorduin; Hydrology, C. S. Jarvis; River Regulation by Reservoirs, Theodore T. Knappen and Calvin V. Davis; Gravity Dams, Calvin V. Davis; Arch Dams, Ivan E. Houk; Buttress Dams, E. H. Burroughs; Earth Dams, Theodore T. Knappen; Rock-fill Dams, I. C. Steele; Spillways and Streambed Protection Works, E. W. Lane; Spillway Crest Gates, James S. Bowman; High-pressure Outlet Works, P. A. Kinzie; Canals, Flumes, Conduits, Tunnels and Pipe Lines, Julian C. Hinds; Hydro-electric Plants, John C. Stevens; Hydraulic Machinery, Lewis F. Moody; Water Supplies, Water Distribution and Water Treatment, Thomas R. Camp; Sewerage and Sewage Treatment Hydraulics, Samuel A. Greeley and William E. Stanley; Irrigation and Irrigation Structures, Ivan E. Houk; Drainage, George W. Pickles; Hydraulic Models, George H. Hickox.

Assembling such a variety of subjects within the covers of a book entitled "Handbook of Applied Hydraulics" appears to be unfortunate and must tend to limit the usefulness of some of the important sections of the book. Only by an extreme stretch of imagination can the design of dams be classed as applied hydraulics, consequently the notable section in this book on buttress dams and the sections on earth, rockfill, and arch dams may well be overlooked by engineers seeking up-to-date information on these subjects.

On the other hand, because the sections on such subjects as water supply, sewage disposal and hydro-electric power development were written to be included in a book on hydraulics, they present a large amount of information on the hydraulic aspects of such work, information that is difficult to find in other texts.

Miscellaneous Notes on Booklets and Reprints

TWO MORE PAMPHLETS of the series entitled "Wartime Road Problems" being prepared by the Highway Research Board, 2101 Constitution Ave., Washington, D. C., have just been issued. These are No. 2, Design of Highway Guards, and No. 3, Design of Concrete Pavement Requiring a Minimum of Steel.

STREET CLEANING METHODS and methods of refuse collection and disposal in the cities of Trenton, Washington, Baltimore, New York, Boston, Rochester, Detroit, Pittsburgh and Philadelphia, are summarized and appraised in a report just issued by the Bureau of Municipal Research of Philadelphia, Philadelphia, Pa. The report was made by Charles A. Howland, staff engineer, and covers the years 1938–1941.

TO MEET THE GROWING DEMAND for information on timber construction due to the scarcity of steel, the Southern Pine Association, New Or-

leans, La., has issued in multigraphed form a large pamphlet entitled "A Course in Modern Timber Engineering". The pamphlet was prepared by H. J. Hansen, instructor in experimental engineering at Tulane University who also is an engineer on the staff of the Southern Pine Association. It is the outgrowth of a course in modern timber design conducted at the university.

INFORMATION ON THE EFFECT OF AERIAL BOMBING on buildings is given in a pamphlet entitled "Structural Defense Against Bombing" just published by the Engineering Institute of Canada. (Price $1.) The pamphlet is based on a series of lectures delivered to Canadian engineers by Prof. F. Webster, deputy chief engineer of the British Ministry of Home Security. Circulation of the pamphlet is restricted. For information apply to the institute headquarters, 2050 Mansfield St., Montreal.

A BOOK OF AGREEMENTS covering the year 1942 has been published by Locals 18, 18-A, 18-B, and 18-C of the International Union of Operating Engineers. Covered are the Ohio cities of Akron, Cincinnati, Cleveland, Columbus, Dayton and Toledo. Types of work included under the agreements are building, excavating, heavy construction, paving, sewers, streets, roads. Copies can be obtained from Frank P. Converse, 216 High Ave., Cleveland.

BLACKOUT SPECIFICATIONS entitled "Traffic Control During Blackouts" have been issued by the War Department to supplement a previous War Department specification entitled "Blackout Requirements for Highway Movement." The specifications were prepared by the Engineer Board with the aid of numerous federal agencies. Copies can be obtained from the Bureau of Public Relations, War Department, Washington, D. C.

New Engineering Books

HANDBOOK OF APPLIED HYDRAULICS—Calvin V. Davis, editor-in-chief. 1,084 pp. McGraw-Hill Book Co., New York & London. $7.50.

WITHOUT FAME: THE ROMANCE OF AN INDUSTRY—By Otto Eisenschiml. 368 pp. Alliance Book Corporation, 540 North Michigan Avenue, Chicago. $3.50.

NICKEL AND NICKEL ALLOYS—The International Nickel Co., Inc., 67 Wall St., New York.

LEONARDO MASTER OF THE RENAISSANCE—By Elizabeth Hubbard Lansing. 237 pp. Thomas Y. Crowell Co., New York. $2.75.

HOW TO GET AHEAD IN A DEFENSE PLANT—By Kenneth C. Hawthorne. 270 pp. Thomas Y. Crowell Co., New York. $2.50.

ENGINEERING MECHANICS—By Bevis Brunel Low. 252 pp. Longmans, Green and Co., London & New York. $4.50.

WOOD PIPE—Catalog No. 19. 331 pp. Federal Pipe & Tank Co., 6851 East Marginal Way, Seattle, Washington.

PUBLICATIONS: 1940-41—International Association for Bridge and Structural Engineering. 305 pp. Verlag AG. Gebr. Leemann & Co., Zurich, Switzerland. Obtainable in the U. S. from G. E. Stechert & Co., 31 E. 10th St., New York.

ROADS AND ROAD CONSTRUCTION YEAR BOOK AND DIRECTORY 1942-43—390 pp. The Carriers Publishing Co., 1 Bridge Place, Belgrave Road, Victoria, London, S. W. 1.

YOUR CAREER IN TRANSPORTATION—By Norman V. Carlisle. 188 pp. E. P. Dutton & Co., New York. $2.

HANDBOOK FOR CONCRETE AND CEMENT—Prepared by the Central Concrete Laboratory, Corps of Engineers, U. S. Army, 320 Washington St., Mt. Vernon, N. Y. Price $3. Make money orders payable to the Treasurer of the United States *at New York.*

Reports and Pamphlets

OHIO STREAM DRAINAGE AREAS AND FLOW DURATION TABLES—By Claude H. Wall and C. V. Youngquist. College of Engineering, the Ohio State University, Columbus, Ohio. 75c.

GUIDES FOR POST-WAR PLANNING—National Planning Association, 800 21st Street, N. W., Washington, D. C. 25c.

URBAN DEVELOPMENT AND HOUSING—National Planning Assoc., 80 31st Street, N. W., Washington, D. C. 25c.

ELEVATIONS OF MAJOR FLOODS ALONG PENNSYIVANIA RIVERS—Commonwealth of Pennsylvania, Department of Forests and Waters.

STREET CLEANING AND REFUSE COLLECTION AND DISPOSAL IN NINE CITIES OF THE UNITED STATES—Bureau of Municipal Research in Philadelphia. By Charles A. Howland.

SPECIFICATION FOR SAND-ASPHALT ROAD MIX COURSE ON NATURAL SAND SUBGRADE—The Asphalt Institute, 801 Second Ave., New York.

ANNUAL REPORT OF THE CHIEF ENGINEER, ISABELA IRRIGATION SERVICE—Bureau of Supplies, Printing, and Transportation, San Juan, P. R.

BUILDING MATERIALS AND STRUCTURES—Performance Test of Floor Coverings for Use in Low-Cost Housing: Part 4. Report BMS 80 (15c). Dimensional Changes of Floor Coverings with Changes in Relative Humidity and Temperature. Report BMS 85 (10c.). Structural Heat-Transfer, and Water-Permeability Properties of "Speedbrik" Wall Construction Sponsored by the General Shale Products Corporation. Report BMS 86 (15c). A Method for Developing Specifications for Building Construction. Report BMS 87 (10c). Structural Properties of "Precision-Built, Jr." (Second Construction) Prefabricated Wood-Frame Wall Construction Sponsored by the Homasote Co. Report BMS 89 (15c). Obtainable from the Superintendent of Documents, Washington, D. C., at prices indicated.

ST. LOUIS, MISSOURI—Twenty-sixth Annual Report of the City Plan Commission.

CUADROS SOBRE INVERSIONES, TRABAJOS EFECTUADOS Y COSTOS EN LA CONSTRUCCION Y CONSERVACION DE CARRETERAS, EN EL ANO 1940—Ministerio De Fomento, Direccion de Caminos y Ferrocarriles, Lima.

WARTIME ROAD PROBLEMS—No. 2, Design of Highway Guards, and No. 3. Design of Concrete Pavements Requiring a Minimum of Steel. Highway Research Board, 2101 Constitution Ave., Washington, D. C.

ROADWAY AND RUNWAY SOIL MECHANICS DATA—Permanency of Clay Soil Densification. By Henry C. Porter. Texas Engineering Experiment Station, A. and M. College of Texas, College Station, Texas.

PROCEEDINGS OF THE CONFERENCE ON HIGHWAY ECONOMICS—Texas Engineering Experiment Station, A. and M. College of Texas, College Station, Texas.

REPORT OF THE NATIONAL RESEARCH COUNCIL 1941—Superintendent of Documents, Washington, D. C.

AMERICAN GEOPHYSICAL UNION TRANSACTIONS OF 1942—Section of Hydrology. Published by the National Research Council, Washington, D. C.

CHARLESTON, SOUTH CAROLINA—Twenty-fifth annual report of the Commissioners of Public Works. 1941.

HONOLULU, HAWAII—Annual report of the Department of Public Works 1941.

THE CONNECTICUT SOCIETY OF CIVIL ENGINEERS—58th Annual report 1942.

THE QUEBEC STREAMS COMMISSION—Twenty-sixth report, year ending Dec. 1, 1937.

GARY SANITARY DISTRICT, SEWAGE TREATMENT WORKS—1941 Annual Report. By W. W. Mathews. Gary Sanitary District Gary, Indiana.

WALTHAM, MASS.—ANNUAL REPORT OF THE DEPARTMENT OF PUBLIC WORKS AND BOARD OF SURVEY AND PLANNING. City of Waltham, Mass. 1941.

THE HANDLE WITH CARE sign is important today. It belongs on every tool and on every piece of equipment in America. We can't afford a speck of waste, and even the toughest equipment will last longer when cared for properly.

For example, your sturdy, long-lived, dependable Exide Batteries will last even longer if you follow the simple maintenance steps given on this page. The rule of the day is *Handle With Care.* Treat your batteries right . . . and you help treat the Axis rough.

MAKING BATTERIES LAST HELPS STOP THE AXIS!

1 Keep adding approved water at regular intervals. Most local water is safe. Ask us if yours is safe.

2 Keep the top of the battery and battery container clean and dry at all times. This will assure maximum protection of the inner parts.

3 Keep the battery fully charged—but avoid excessive over-charge. A storage battery will last longer when charged at its proper voltage.

4 Record water additions, voltage, and gravity readings. Don't trust your memory. Write down a complete record of your battery's life history. Compare readings.

If you wish more detailed information, or have a special battery problem, don't hesitate to write to Exide. We want you to get the long-life built into every Exide Battery. Ask for booklet Form 1982.

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THE ELECTRIC STORAGE BATTERY COMPANY, Philadelphia
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Exide Batteries of Canada, Limited, Toronto

CONTRACT UNIT PRICES

What contractors are bidding on different kinds of construction work

HIGHWAY BRIDGES, MARYLAND

OWNER: State Roads Commission of Maryland, Baltimore.

PROJECT: Construction of dual overcrossing structures and concrete surfacing 1.293 miles of roadway near Cranberry Run on Philadelphia Road toward Boothby Hill, in Harford County, Md. The dual bridge for dual highway is steel I-beam structure with concrete floor, and concrete substructure. Each bridge includes three spans, two of which are 52½-ft. and one 71-ft. Roadway width of each is 28-ft., and each includes two sidewalks, one 3-ft. wide, and the other 4-ft. Contract includes highway approaches and an additional bridge over U. S. Highway No. 40.

CONDITIONS: Contractor to furnish all materials and complete work in 142 working days. Rail and highway transportation facilities available. Minimum wage rates specified are: skilled labor, 70c. per hour; semi-skilled, 55c.; and common, 40c. Approximate contract cost of dual bridges over Pennsylvania Railroad is $145,000.

BIDS: Three bids were opened July 28, 1942, ranging from the contract low of $597,541 to $609,220.

LIST OF BIDDERS:

1. Frank Carozza, Baltimore, Md. (contract) $597,541
2. H. R. Miller Co., Lancaster, Pa. 603,390
3. C. J. Langenfelder & Son, Rosedale, Md. 609,220

Item	Quan.	Unit Prices (1)	(2)	(3)
1. Clearing and grubbing	L.S.	$14,000.00	$5,000.00	$10,000.00
2. Class No. 1 excavation	12,500 c. y.	.60	.50	.65
3. Class No. 2 excavation	2,600 c. y.	4.00	5.00	3.75
4. Class No. 5 excavation	700 c. y.	1.50	3.00	1.25
5. Borrow excavation	263,500 c. y.	.70	.60	.71
6. Tamped fill	2,400 c. y.	1.50	2.00	1.50
7. Earth shoulders	3,950 s. y.	.15	.40	.25
8. Seeding park area	116 M s. f.	10.00	6.00	12.00
9. Furn. and place topsoil	13,000 s. y.	.40	.60	.45
10. Sodding	4,100 s. y.	.40	1.25	.50
11. Trim exist. ditches	500 l. f.	.20	.60	.30
12. Remove exist. pavmt., sidewalk, curb, and comb. curb and gutter	50 c. y.	8.00	6.00	7.00
13. Remove existing masonry	5 c. y.	8.00	6.00	9.00
14. Stabilized base course	425 ton	3.00	4.00	2.50
15. Calcium chloride	18 ton	40.00	40.00	50.00
16. Sub-base	350 c. y.	3.00	4.00	3.00
17. Stabilized shoulders (screenings)	8,900 s. y.	.50	.50	.60
18. 10x8-in. plain. cem. conc. pavmt. (A reg.)	31,600 s. y.	3.60	3.50	3.40
19. 10x8-in. plain. cem. conc. pavmt. (X ES)	1,400 s. y.	4.00	3.90	3.80
20. 9-in. plain. cem. conc. pavmt. (A reg.)	2,300 s. y.	4.00	3.60	3.80
21. 9-in. plain. cem. conc. pavmt. (X ES)	1,050 s. y.	4.50	4.00	4.20
22. Aggregate for underdrain	10 c. y.	4.00	5.00	4.50
23. 6-in. conc. pipe underdrain outlets	50 l. f.	.80	3.00	1.00
24. 6-in. perf. conc. pipe underdrain	100 l. f.	.80	3.00	1.00
25. 15-in. rein. concrete pipe	1,627 l. f.	2.00	3.00	4.00
26. 18-in. rein. concrete pipe	629 l. f.	3.00	3.50	5.50
27. 24-in. rein. concrete pipe	255 l. f.	4.00	4.75	6.50
28. Remove old pipe culverts	200 l. f.	1.00	3.00	1.50
29. Relay old pipe culverts	200 l. f.	2.00	3.00	2.00
30. 15-in. 90-deg. conc. pipe elbow	4 ea.	15.00	25.00	12.00
31. 15-in. 30-deg. conc. pipe elbow	4 ea.	15.00	25.00	12.00
32. 15x15-in. rein. conc. pipe tee section	1 ea.	20.00	30.00	15.00
33. 15x18-in. rein. conc. pipe tee section	3 ea.	25.00	35.00	20.00
34. Treated timber, Class A timber piles	3,300 l. f.	3.50	3.50	2.50
35. Timber test piles	100 l. f.	3.50	5.00	4.00
36. Test piles (railroad bridge)	80 l. f.	6.00	6.00	12.00
37. Cast-in-place concrete piles	2,100 l. f.	6.00	6.00	9.00
38. Class A conc. pipe endwalls (A reg.)	50 c. y.	40.00	55.00	50.00
39. Class A concrete (A reg.)	1,800 c. y.	40.00	46.00	40.00
40. Class B concrete (B reg.)	325 c. y.	35.00	35.00	32.00
41. Reinforcing steel bars	223,700 lb.	.06	.07	.0675
42. Plain structural steel	64,600 lb	.07	.075	.075
43. Fabricated structural steel	554,000 lb.	.07	.09	.075
44. Wrought iron blast plates, etc.	2,840 lb.	.20	.30	.20
45. Plywood facing	L.S.	2,000.00	4,000.00	1,500.00
46. Treated timber	92 Mbm.	200.00	190.00	210.00
47. Untreated timber	18 Mbm.	250.00	225.00	240.00
48. Damp-proofing (Sta. 27+)	L.S.	500.00	200.00	800.00
49. Drainage system	L.S.	2,000.00	400.00	4,000.00
50. Furnish and install conduits	L.S.	1,000.00	2,000.00	1,500.00
51. Expansion material in bridge (Sta. 0+00)	L.S.	1,000.00	900.00	1,000.00
52. Expan. material in bridge (Sta. 27+)	L.S.	2,000.00	300.00	1,500.00
53. 5-in. plain. cem. conc. gutter (A reg.)	200 s. y.	4.00	3.00	3.50
54. 8-in. plain cem. conc. gutter (A reg.)	25 s. y.	5.00	5.00	4.50
55. Comb. cem. conc. curb and gutter (A reg.)	6,200 l. f.	2.00	2.00	1.80
56. 8x22-in. plain cem. conc. curb (A reg.)	1,000 l. f.	1.50	2.00	1.50
57. Integral cem. conc. curb	600 l. f.	3.00	2.00	2.50
58. White cem. conc. curb separator (A reg. and white)	100 l. f.	4.00	5.00	3.50
59. Guard rail posts	452 ea.	5.00	5.00	4.50
60. Cedar posts	64 ea.	5.00	6.00	4.50
61. Maintenance of traffic	L.S.	1,000.00	4,500.00	2,000.00
62. Manhole	1 ea.	250.00	250.00	200.00
63. Type H combination inlets	11 ea.	250.00	250.00	250.00

SOUTH WESTERN AVENUE BRIDGE ALTERATIONS, CHICAGO

OWNER: Department of Public Works, Chicago.

PROJECT: Alteration of fixed bridge superstructure of South Western Avenue Bridge over Sanitary and Ship Canal in Chicago into vertical lift bridge. Includes replacement of concrete deck with timber and asphalt plank. Clearance of bridge unaltered is 26-ft.; after conversion, clearance will be 47-ft.

CONDITIONS: Contractor to furnish all materials, but city may furnish pile protection. Reduction in cost may be accomplished by eliminating all sheet piling at top. Time charge offset $300 per calendar day for 180 days. Total cost of project to depend on date bridge can be lifted. Deductions will be based on that time. Project carries an A-A priority rating. Electrical equipment bids were taken separately. Wage rates are: skilled labor, $1.625 to $2.00 per hour; semi-skilled, $1.10 to $1.70; and common labor, $1.02½ to $1.10.

BIDS: Two bids were opened July 27, 1942. Based on the 180-day time charge offset, they were the contract low of $470,945, and $473,315. Electrical equipment bids for motors and brakes, gates, switches, warning lights, transformers, cables, wires, telephones, control apparatus, etc., and the operation of the bridge for 30 days, were received August 3, 1942. The three bids opened were: the contract low of $83,565 from Divane Brothers; $93,174 from Fries Walters Co.; and $101,816 from Garden City Engineering Co.

LIST OF BIDDERS: (Alterations only)

1. William J. Howard, Inc., Chicago, Ill. (contract) $470,945
2. Overland Constr. Co., Chicago, Ill. 473,315

Item	Quan.	Unit Prices (1)	(2)
1. Fences and sheds	L.S.	$14,000.00	$5,770.00
2. Furn. and del. struct. carbon steel	1,300,000 lb.	.07	.0727
3. Furn. and del. wire rope and attachments	3,500 l. f.	2.80	2.87
4. Furn. and del. steel forgings, excl. of machinery	5,000 lb.	.21	.22
5. Furn. and del. cast steel, excl. of machinery	13,000 lb.	.25	.26
6. Erect and alter steel as specified, excl. machinery	L.S.	87,000.00	74,630.00
7. Reinforcement metal	12,000 lb.	.09	.10
8. Standard portland cement	400 bbl.	3.00	3.00
9. High early strength cement	350 bbl.	3.50	3.50
10. Concrete, Cl. 1, excl. cement	60 c. y.	40.00	42.00
11. Concrete, Cl. 2, excl. cement	350 c. y.	30.00	32.00
12. Transport, handle and place salvaged comp. counterweight blocks	55 ton	10.00	12.00
13. Douglas fir and yellow pine	125 Mbm.	220.00	169.00
14. 1¼-in. asphalt planking	1,300 s. y.	3.30	3.50
15. Removal of masonry	700 c. y.	40.00	54.00
16. Machinery, complete	L.S.	80,000.00	95,000.00
17. Operat. house machinery, enclosed platforms, stairways, railings	L.S.	42,000.00	43,000.00
18. Furniture, lockers and equipment	L.S.	400.00	200.00
19. Field painting, except house and encl. work	L.S.	6,000.00	3,500.00
20. Time charge offset, $300 per calendar day (180 days)	L.S.	54,000.00	54,000.00
21. Pre-heating and extra mixing of concrete	500 c. y.	4.00	5.50
22. Covering and heating concrete in place	500 c. y.	4.00	5.50
23. Mechanics' time, wages per hour	200 hr.	4.00	3.00
24. Laborers' time, wages per hour	300 hr.	3.00	2.00

INVISIBLE SABOTEUR!

PREVENT FALL SLOW-DOWNS . . .

USE 'INCOR' 24-HOUR CEMENT

COLD weather sneaks up on you . . . slows down the job . . . exposes concrete to freezing risk. Fall is the dangerous season . . . warm sunny days give no warning of sudden temperature drops at night.

Don't get caught napping. Don't let cold weather sabotage your schedules. Speed was never as important as it is right now. 'Incor' 24-Hour Cement saves worry, time and money.

Heat mixing water . . . protect concrete promptly after placing. For early service and stripping strengths, supply enough heat to maintain 60° to 70° curing temperatures for 24 hours. 'Incor' pays its way in heat and labor savings . . . 2 or 3 days less protection on each pour. High-speed schedules . . . 50% to 60% less forms.

LONE STAR CEMENT CORPORATION

Offices: ALBANY • BIRMINGHAM • BOSTON • CHICAGO • DALLAS • HOUSTON • INDIANAPOLIS • JACKSON, MISS.
KANSAS CITY • NEW ORLEANS • NEW YORK • NORFOLK • PHILADELPHIA • ST. LOUIS • WASHINGTON, D. C.

LONE STAR, WITH ITS SUBSIDIARIES, IS ONE OF THE WORLD'S LARGEST CEMENT PRODUCERS . . 15 MODERN MILLS . . 25-MILLION BARRELS ANNUAL CAPACITY

MATERIALS AND LABOR PRICES

Market quotations on construction materials and wage rates reported monthly by ENR correspondents

NOVEMBER CONSTRUCTION material prices, with minor exceptions, remain at the preceding months' levels. Cement, paint and roofing products, iron and steel products, cast iron pipe, vitrified sewer pipe, clay drain tile, lumber, gravel, ready-mixed concrete, paving brick, and paving asphalt in tank cars are unchanged. Sand is up in Denver. Crushed stone is 5c. per ton lower in Los Angeles.

Structural clay tile increased on some sizes in Denver, and on all sizes in Seattle. Common brick is up $1.00 per M in Denver, and up 50c. per M in Seattle. Straight hard brick is off 50c. per M in Chicago and Denver but up 50c. in Seattle. Lime prices declined in Denver.

San Francisco bricklayers' rate is $1.875, an increase of [illegible] per hour. Carpenters' wage is up 7c. in Denver and 6¼c. in San Francisco. Structural ironworkers' rate also rose in Denver and San Francisco.

Common labor on building and heavy construction climbed to 80c. per hour in Denver, and to 95c. in San Francisco.

CEMENT, AGGREGATES, READY-MIXED CONCRETE—F.O.B. CITY

	PORTLAND CEMENT			SAND AND GRAVEL			CRUSHED STONE		CRUSHED SLAG		CONCRETE
	Per bbl., carload lots, including 40c per bbl. for bags, cash discount not deducted			Per ton, carload lots			Per ton, carload lots		Per ton, carload lots, f.o.b. plant		Ready Mixed 1:2:4, 50 c.y. or more, delivered
	Cloth Bags *a*	Paper Bags	Bulk	Gravel, 1½ in.	Gravel, ¾ in.	Sand	1½ in.	¾ in.	1½ in.	¾ in.	
Atlanta	$2.77	$2.52	$2.47	$1.79	$1.89	$1.99	$1.79	$1.89	$1.59	$1.69	$8.01
Baltimore	2.33	2.08	1.88	1.75‡	1.75‡	1.25‡	1.75‡	1.75‡	1.75‡	1.75‡	7.25
Birmingham	2.50	2.25	....	1.75	1.75	1.50	.85	1.00	.90	1.15	5.80
Boston	2.75*b*	2.50*b*	2.30	1.40‡	1.40‡	1.00‡	1.40‡	1.40‡	....	....	7.25*m*
Chicago	2.70	2.45	2.30	2.15‡*d*	2.15‡*d*	2.15‡*d*	2.15‡*d*	2.15‡*d*	1.75‡	1.75‡	....
Cincinnati	2.31	2.06	1.81	1.20	1.20	1.10	1.80	1.80	....	....	6.60
Cleveland	2.39	2.14	....	1.50*i*	1.50*i*	1.30*i*	1.75*i*	1.75*i*	1.75*i*	1.75*i*	7.30*n*
Dallas	2.52	2.27	2.07	1.50*p*	1.70*p*	1.10*p*	1.69*p*	1.79*p*	....	....	6.20
Denver	3.08	2.88	....	1.20	1.40	1.25	1.65	1.75	....	....	7.25
Detroit	2.40	2.15	1.95	2.25	2.00	1.10	2.25	2.25	2.00‡	2.00‡	6.50
Kansas City	2.58	2.33	2.18	1.85	2.30	1.00	1.91	1.91	....	....	7.50*n*
Los Angeles	2.80*v*	2.20*v*	....	1.20	1.20	1.15	1.15*f*	1.20*f*	....	....	6.65
Minneapolis	2.90	2.65	....	1.00*h*	1.00*h*	.25*h*	1.00*h*	1.00*h*	....	....	7.35*j*
Montreal	....	1.95*rs*	1.79*rs*	....	....	1.25‡*t*	1.20‡*ct*	1.30‡*ct*	....	....	7.90*s*
New Orleans	2.41	2.16	1.96	1.65	1.65	.90	....	....	....	....	....
New York	2.66‡	2.41‡	....	1.60*ds*	1.60*ds*	.90*ds*	1.70*ds*	1.80*ds*	....	....	7.25*k*
Philadelphia	2.32	2.07	1.87	1.55‡	1.65‡	1.20‡	1.90	1.95	1.10	1.10	8.20
Pittsburgh	2.44	2.19	1.99	1.40‡	1.40‡	1.70‡	2.25‡	2.25‡	1.50	1.50	8.25
St. Louis	2.80	2.52	....	1.75‡	1.50‡	1.25/1.50‡	1.10*h*	1.10*h*	.75*g*	.75*g*	8.00
San Francisco	....*u*	2.22	1.92	1.36	1.36	1.36	1.46	1.46	....	....	7.55
Seattle	2.95*o*	2.75*o*	....	1.00*o*	1.00*o*	1.00*o*	2.00*o*	2.00*o*	....	....	7.25

‡ Delivered. *a* 10c. allowed for each returnable bag. *b* 10c. per bbl. off for cash. *c* Plus municipal tax. *d* Per cu. yd. *e* Barge lots alongside docks. *f* Crushed granite. *g* F.o.b. Granite City, Ill. *h* F.o.b. plant. *i* Within three miles of Public Square. *j* 5% discount for cash. *k* Discount of 25c per. c. y. for cash in 10 days. *l* Up to 200 cu. yd. *m* 50c. off for cash *n* 25 c.y. or more *o* 2% off for cash. *p* 10c. per ton off, cash 15 days. *r* 10c. per bbl. off, cash 20 days. *s* 8% sales tax included. *t* 8% sales tax not included. *u*. Price withdrawn. *v* 20c. per bbl. discount; 20c. allowed for returnable cloth bag.

CASH DISCOUNTS CEMENT to Contractors: truck delivery, 2% for cash on 10th of month; on carload deliveries, no trucking, same as dealer cash discount 10c. per bbl. for payment within 15 days of date of invoice. Subject discount 10c. per bbl. 20 days in Montreal.

CURRENT MAXIMUM PRICES RECEIVED AT CEMENT MILL

Charge for bags not included. For cloth bags, add 40c. per bbl.; 10c. refund allowed for each returnable bag; for paper bags add 15c. per bbl., not refundable.

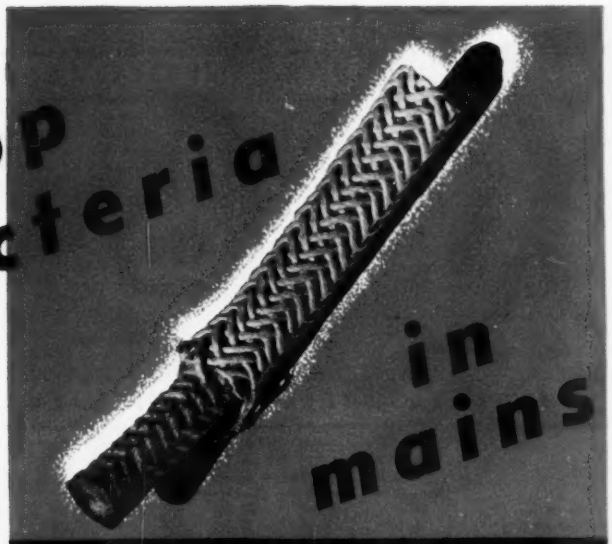
	Bagged	Bulk		Bagged	Bulk		Bagged	Bulk
Buffington, Ind	$1.70	$1.65	Ironton, Ohio	$1.60	$1.55	Richard City, Tenn	$1.80	$1.75
Dallas, Tex. (Inc. 10c. tax)	1.85	1.80	Limedale, Ind	1.70	1.65	Steelton, Minn	1.80	1.75
Hannibal, Mo	1.70	1.65	Norfolk, Va	1.75	1.70	Universal, Pa	1.65	1.60
Hudson, N. Y	1.75	1.70	Northampton, Pa	1.55	1.50	Waco, Tex. (Plus 10c. tax in Tex.)	1.75	1.70
Independence, Kans	1.70	1.65	North Birmingham, Ala	1.70	1.65	Montreal (8% sales tax incl.)	1.68	1.67

PAVING BRICK, BLOCKS, ASPHALT, ROAD OILS—F.O.B. CITY

	PAVING BRICKS AND BLOCKS			PAVING ASPHALT		ASPHALT BINDERS—FLUXES		CUTBACK ASPHALT		ROAD OILS	ASPHALT EMULSION (Quick-breaking)
	Granite per M. lots of 50,000 3x4x8 in.	Brick per M. 3x4x8½ in. carload lots	Wood per sq. yd. 3½ n. 16-lb. treat	Per ton, less than 80 penetration		Per gal., 80-300 penetration		Per ton		Per gal.	Per gal.
				Tank car	Drums	Tank car	Drums	Tank car	Drums	Tank car	Tank car	Drums
Atlanta	$73.00	$39.35	$2.25	$18.40*e*	$24.62*e*	$0.0787*e*	$0.1309*e*	$0.0826*he*	$0.1348*h*	$0.0676*e*	$0.0826	$0.1384
Baltimore	150.00‡	45.00‡	80.00*m*	15.00	21.00	.06	.09	13.00	23.00	.065	.07	.14
Birmingham	.....	32.00*j*	....	17.95	.....†	.0747	.....†	.0834*h*	.....†	.065	.09	.....†
Boston	85.00	55.00	3.75	14.00	20.00	.06	.09	.065*h*	.115*h*	.065	.09‡	.12‡
Chicago	150.00	55.00	2.20*d*	14.80	20.80	13.00*g*	18.50*g*	.0625*h*	.15*h*	.05*n*	.08	.12/.14
Cincinnati	112.00	37.50	....	16.40	.....	.085	.....	12.25	.....	.07	.085	.....
Cleveland	110.00	38.50	2.25	20.00	25.00	.09	.155	.10*h*	15.00	.07	.11	.15
Dallas	.....	36.00	....	13.25	20.30	.06	.11‡	16.00	24.80	.06	.05/.07	.07/.09
Denver	.....	27.50	....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Detroit	.....	37.50	....	15.10*f*	22.60*f*	.0725	.1262	15.10	21.10	.067	.0725	.1262
Kansas City	.....	40.00	....	18.50	23.50	.077	.1075	.077*h*	.107*h*	.057	.11	.15
Los Angeles	.....	50.00	....	6.50*b*	15.00	6.50*bg*	15.00*bg*	5.50*b*	.....	.0192	.0525	.1125
Minneapolis	.....	.....	1.87*d*	.....	27.70	.....	.126	.....	32.64	.....	.....	.....
Montreal	.....	.....	....	16.60*k*	24.25*k*	.116*k*	.1485*k*	.115*hk*	.135*hk*	.08*k*	.135*k*	.188*k*
New Orleans	.....	.....	....	13.00*n*	19.00*n*	.055	.085	.06*h*	.09*h*	.....	.078	.....
New York	.....	.....	....	16.40	23.50*p*	.064	.124*p*	.07*h*	.13*hp*	.0675	.0725	.1225*p*
Philadelphia	130.00	58.00	3.96	14.00	.....	.055	.....	.065*h*	.....	.055	.065	.....
Pittsburgh	135.00	38.75	....	.....	.....	.....	.....	.....	.....	.....	.....	.....
St. Louis	.....	37.00	....	15.00*n*	21.00*n*	14.00*gn*	20.00*gn*	.065*hn*	.11*hn*	.05*n*	.09*n*	.8125*n*
San Francisco	.....	70.00	....	9.50	18.00	9.50*g*	18.00*g*	10.00	17.50	9.50*g*	.0525	.1125
Seattle	.....	60.00*c*	....	9.50*i*	18.00*i*	.....	19.00*gi*	10.00*i*	.....	9.50*i*	.0575*i*	.0675*i*

‡ Delivered. *a* F.o.b. Baton Rouge. *b* Delivered to purchaser's warehouse. *c* 3½x4x8½ in. *d* 2½ in. 12-lb. treatment. *e* Local reduction due to 20% reduction intra-state class freight rates, only Georgia affected. *f* Mexican. *g* Per ton. *h* Per gallon. *i* F.o.b. Martinez. *j* 3x3½x8½ in. *k* Tax included. *m* Per thousand. † Available on priority only and quoted specially. *n* September price, none later available. *p* No steel drum shipments except to armed forces.

Stop bacteria in mains



A *Sanitary* Packing—Used in Jointing Bell and Spigot Pipe for Water, Sewer Mains and Soil Pipe.

USED LIKE BRAIDED JUTE WILL NOT BREED BACTERIA

FIBREX is a paper packing treated with a special water repellent which keeps it sterile and prevents its disintegration. It has a hard twisted core with a basket weave covering. Fibrex packs in a joint exactly the same as braided jute.

FIBREX is put up in 35 and 60 pound reels. It is priced slightly higher than braided jute but is much less expensive as 70 pounds of Fibrex will go as far as 100 pounds of jute.

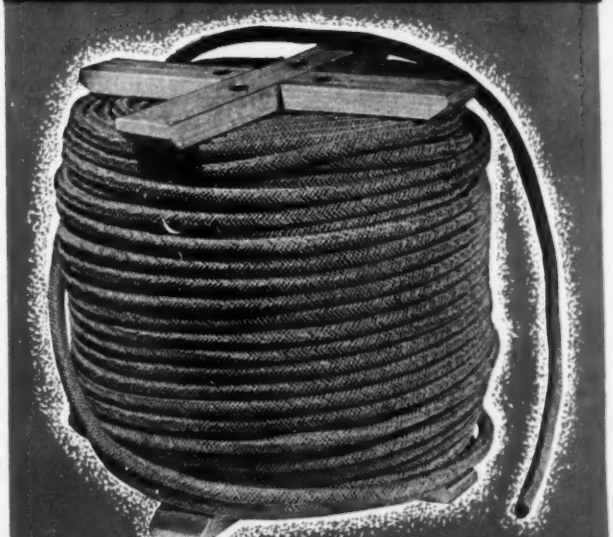
FIBREX is being used with Hydro-Tite and other self-caulking compounds, with lead, Sani-Tite and other asphalt sewer joint compounds. Thousands of pounds of Fibrex are in service in both water and sewer joints throughout the country.

See page 118 for the complete story on Hydro-Tite—the dependable self-caulking compound.

HYDRAULIC DEVELOPMENT CORPORATION
Main Sales Office: 50 CHURCH STREET, New York, N. Y.
Works: WEST MEDFORD STATION, Boston, Mass.

DRY BRAIDED

Fibrex



Laboratory studies of "Fibrex", the new joint caulking material, indicate that the material has little capacity to support bacterial growth. This is in sharp contrast with the conditions that develop when traditional caulking fibers are used. The published studies of such men as Anderson, Calvert, Kingsbury and Adams as well as numerous others have indicated that the vegetable fibers in caulking material tended to support bacterial growth to a serious extent. The introduction of a processed material of the Fibrex type is therefore not only timely, but in the long run, constructive.

From A.W.W.A. Journal—Sept., 1942

IRON AND STEEL PRODUCTS—BASE MILL PRICES

	STRUCT. SHAPES-PLATE	REINF. BARS ¼-in. billet *b*	RIVETS ½-in. structural	WIRE NAILS Base *d*	SHEET PILING Base	STEEL RAILS Per Gross Ton: Standard	Light	Re-rolled	TRACK SUPPLIES: Angle Bars	Std. Spikes *c*	Tie Plates *c*	Track Bolts
Birmingham	$2.10	$2.15	$3.75	$2.55	.....	$40.00	$40.00	$39.00	$2.70	$3.00	$2.15	$4.75
Chicago	2.10	2.15	3.75	2.55	$2.40	40.00	40.00	39.00	2.70	3.00	2.15	4.75
Pittsburgh	2.10	2.15	3.75	2.55	2.40	40.00	40.00	39.00	2.70	3.00	2.15	4.75
Buffalo	2.10	2.15	.....	.....	2.40	.....	.....	.....	.....	.....	2.15	.....
Cleveland	2.10	2.15	3.75	2.55	.....	.....	.....	.....	.....	.....	.....	.....
Youngstown	.....	2.15	.....	.....	.....	.....	.....	.....	.....	3.00	.....	.....
Detroit	.....	2.27‡	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Gulf ports	2.47*a*	2.52*a*	.....	.....	2.85*a*	.....	.....	.....	.....	.....	.....	.....
Pacific ports	2.75*a*	2.80*a*	.....	.....	2.95*a*	.....	.....	.....	.....	.....	2.30	.....

‡ Delivered. *a* F.o.b. cars dock. *b* Rail steel same as billet prices. *c* Other basing points include Portsmouth, O., Weirton, W. Va., St. Louis, Kansas City, Minnequa, Colo., and Pacific coast ports, on tie plates, alone, Steelton, Pa., on spikes alone, Lebanon, Pa., Richmond, Va. *d* Add switching charge $18 per c.l.

IRON AND STEEL PRODUCTS—F.O.B. WAREHOUSE, PER 100 LB., BASE PRICE

	STRUCTURAL SHAPES Per 100 lb. base price	REINFORCING BARS* Per 100 lb., ¼ in., base price: 15 tons or over *b* New billet	Rail steel	Add $/cwt. for Switch	Del.	EXPANDED METAL LATH Per 100 sq.yd., carload lots: Std. diamond mesh, 3.4 lb.	Std. ribbed 3.4 lb.	WELDED FABRIC REINFORCING Per 100 s.f., carload lots: 4x16 in., No. 5 & 10 wires	4x12 in., No. 8 & 12 wires	6x6 in. No. 6 & 6 wires Per sq. yd.	SHEET PILING Per 100 lb. base price
Atlanta	$2.34	$2.39	$2.39	$.02½	$.10	$21.06	$23.00	$1.82	$1.35	$0.1719	$3.04
Baltimore	3.70	2.90	2.75	.....	.10	22.50	24.50	1.70	1.27	.1611	3.00
Birmingham	2.10*a*	2.15	2.15	.02½	.10	19.00	21.00	1.80	1.34	.1701	.....
Boston	3.85	3.51	3.36	$20 C.L.	.10	18.50	29.50	1.76	1.31	.1656	2.70
Chicago	2.10*a*	2.15	2.15	.03	.05	21.50	23.50	1.67	1.25	.1575	2.40
Cincinnati	3.68	2.53*cd*	2.53*cd*	.....	.05	19.50	21.50	1.66	1.25	.1566	.....
Cleveland	2.10*a*	2.15	2.15	.02½	.10	19.50	21.50	1.66	1.25	.1566	.....
Dallas	4.25	3.17	3.17	.....	.....	25.00	27.50	1.93	1.42	.1827	.....
Denver	4.35	3.95	3.85	.....	.....	26.50	28.50	1.97	1.45	.1863	.....
Detroit	3.65‡	2.52‡	2.52‡	.....	.10	23.00	25.00	1.68	1.26	.1584	2.68
Kansas City	4.00	2.64*cd*	2.64*cd*	.0	.05	19.60	23.60	1.78	1.33	.1683	2.89
Los Angeles	3.65*f*	3.32	3.32	.02½	.05	23.00	27.50	1.93	1.42	.1827	3.65
Minneapolis	3.80‡	2.75	2.75	.0	.10	25.00	27.00	1.80	1.34	.1701	2.75*d*
Montreal	4.00*i*	2.90*i*	2.80*i*	.....	.....	26.00*hij*	33.00*hij*	2.56*i*	3.14*i*	.2685	.....
New Orleans	4.40	2.52	2.52	.05	.10	21.50	23.50	1.82	1.35	.1719	2.875
New York	3.75	2.76*c*	2.76*c*	.....	.15	17.50	19.50	1.76	1.32	.1665	2.74
Philadelphia	3.65	3.85	....	.....	.....	19.50	21.50	1.71	1.28	.1611	2.74
Pittsburgh	2.10*a*	2.15	2.15	.02½	.10	23.00	26.50	1.59	1.20	.1503	2.40
St. Louis	3.69	2.75	2.75	.0	.05	28.00	34.00	1.69	1.27	.1602	2.70
San Francisco	4.35	2.825	.....	.02½	.10	21.00	24.50	1.93	1.42	.1827	3.85
Seattle	2.75*e*	2.50*e*	.....	.....	.....	34.50	38.50	1.93	1.42	.1827	2.95*ej*

‡ Delivered. *a* Mill prices. *b* 5–15 tons, add 15c. 1–5 tons, add 25c. Less than 1 ton, add 50c. *c* 20 tons or over Base. *d* Mill price plus freight. *e* F.o.b. dock. *f* Includes delivery in free delivery zone. *g* Less than 1 ton, add 25c.; 1 to 5 tons, add 10c. * High scrap steel prices cut former 15c. differences between new billet and rail steel in many mills. *h* List price. *i* Plus Dominion and Province sales tax. *j* August price; not on market.

PLUMBING, HEATING, WATER, SEWER AND DRAIN PIPE

	C. I. PIPE Per net ton f.o.b. 6 in. to 24 in.*a*	VITRIFIED SEWER PIPE: Per foot, std. 8 in., s.s.	delivered std. 12 in., s.s.	ASTM 24 in.,	C13–35 36 in.,	CLAY DRAIN TILE Per 1,000 ft., carload lots, f.o.b. 6 in.	8 in.	CONCRETE SEWER PIPE Per ft., delivered; ASTM 12 in.	C 14–35 24 in.	WROUGHT STEEL PIPE Full standard weight, *k*: 1 to 3 in., Butt Weld Black %	Galv. %	3½ to 6 in.; Lap Weld Black %	Galv. %
Atlanta	$49.66	$0.265	$0.468*bc*	$1.8525	$4.68*c*	$85.00	$128.00	$0.45	$1.642	48.2	54.2	59.7	51.2
Baltimore	53.00	.35	.60	2.65	7.25	160.00	200.00	.50	1.75	65.5	57.5	63.0	54.5
Birmingham	45.00	.275	.495	1.95	5.50	100.00	220.00	.50	1.70	62.2	54.2	59.7	51.2
Boston	55.40	.26	.463	2.07	5.85	140.00	.....	.70	....	64.1	56.1	61.6	53.1
Chicago	54.33	.35	.675	2.70	7.00	100.00‡	150.00‡	.45	1.85	62.2	54.2	59.7	51.2
Cincinnati	53.27	.231	.4455	1.80	5.125	105.00	170.00	.60	1.70	65.9	57.9	63.4	54.9
Cleveland	54.75	.203	.3915	1.665	5.125	81.00	125.00	.30	1.60	67.8	59.8	65.3	56.8
Dallas	56.43	.31	.58	2.25	5.00	90.00	110.00	.46	1.57	59.9	51.9	57.3	48.3
Denver	61.56	.29†	.52†	2.16†	....	130.00	240.00	....	....	58.4	50.4	55.7	47.2
Detroit	54.75	.245	.4725	1.935	5.14	82.50	131.25	.35	1.50	66.3	58.3	63.8	55.3
Kansas City	55.73	.315	.39	2.20	5.86	140.00	260.00	.45	1.60	62.9	54.9	60.0	51.5
Los Angeles	68.40	.282†	.508†	2.034†	5.085†	115.50	192.50	1.00	2.00	59.6	51.6	57.0	48.6
Minneapolis	57.83	.275†	.495†	1.98†	5.14†	.....	.....	.90	2.10	64.2	56.2	60.7	52.2
Montreal	60.00	.85	1.50	5.25	8.50*e*	45.00*m*	64.00*m*	.48*m*†	1.92*m*†	....	....	....	....
New Orleans	51.78	.26	.48	1.69	.....	150.00	220.00	.40	2.10	62.4	54.4	58.8	50.3
New York	52.40	.455	.8775	2.925	7.65	.....	.....	.60	1.40	64.9	56.8	62.4	53.9
Philadelphia	51.00	.28	.54	2.30	6.75	150.00	225.00	.45	1.75	56.4	42.6	53.3	38.9
Pittsburgh	56.00	.245†	.4725†	1.845†	5.4325	97.80	154.20	.85*g*	2.00*g*	68.5*i*	57.5*i*	66.0*i*	54.5*i*
St. Louis	52.84	.28	.504	2.016	4.50	85.00	220.00	1.00*j*	1.50*k*	56.4	42.6	52.5	38.1
San Francisco	68.40	.3625*d*	.6525*d*	2.61	6.52	115.50	192.50	.58	2.34	46.0	32.0	42.0	27.0
Seattle	70.20	.375	.675	2.70	6.75	84.00	187.50	.51*f*	1.44*f*	....	....	....	....

‡ Delivered. † F.o.b. *a* B. & S. class B and heavier, C/L lots, 200 tons and over Burlington, N.J. (base) $49.00. Based on existing freight rates; subject to rate change. Gas pipe and class A, $3 per ton additional, 4 in., $3 per ton additional, 30 in. and larger usually $2 per ton less. *b* Double strength. *c* List to dealer. *d* List. *e* 30-inch. *f* Less 5% for cash. *g* Culvert pipe. *h* Discounts from standard list consumers carload prices, except Pittsburgh prices are f.o.b. mill. Base price $200 per net ton. List prices per ft.: ¾ in., 8½c.; ¾ in., 11½c.; 1 in., 17c.; 2 in., 37c.; 2½ in., 58½c.; 3 in., 76½c.; 4 in., $1.09; 6 in., $1.92. *i* Applies also at Lorain, Ohio, mills. Chicago delivered base is 2½ points less on butt, 1½ on lap. Freight is figured from Pittsburgh, Lorain, O., Chicago Dist. Billing is from point producing lowest price at destination. WROUGHT IRON PIPE: Base price and list prices per ft. same as wrought steel pipe. Discount for Pittsburgh base: Butt-weld—1 in. and 1¼ in. black 34, galv. 16; 1½ in. black 38, galv. 18½; 2 in. black 37½, galv. 18. Lapweld—2½ in. to 3½ in. black 31½, galv. 14½; 4½ in. to 8 in. black, 32½ galv. 17. *j* Reinforced; spec. C 76–37. *k* Reinforced; spec. C 75–37. *l* Plus sales tax. *m* Tax included.

SOLD!
and Delivered to HIROHITO, ETC.
Without Priority – and Fast Delivery Guaranteed!

Yes, sold to Hirohito and his gang—and d... fast delivery guaranteed—even without priority.

Every contractor, county and municipality has obsolete equipment stowed away in hidden by-ways, in forgotten storage, in unused garages—most of it *big* tonnage stuff that has long since lost its value.

Mister, there never was a better time to get rid of those jalopies. Turn them into scrap *now*, and let's deliver them to the Axis in the form of bullets and bombs.

- You will be making a major contribution to the war effort by supplying *tons* of essential steel scrap.
- You will get rid of a lot of old unnecessary stuff and clear the way for the modern and more efficient equipment which manufacturers' research and development will have ready after the war.

How to make your scrap, scrap for you

Get in touch with your nearest Lorain distributor. He will be glad to help you turn your jalopies into bombs and can advise you on any parts of equipment which should be retained for replacement use on other machines.

Then, too, he can help you do more with your present equipment because he has complete facilities for ***rebuilding, repairing*** and ***servicing.*** For rapid-fire action on today's problems and for the newest developments in shovels, cranes and draglines tomorrow, get acquainted with your Lorain distributor. He's on his toes.

THEW CENTER DRIVE

THE THEW SHOVEL COMPANY
LORAIN, OHIO

THEW-LORAIN

CRANES • SHOVELS
DRAGLINES • MOTO-CRANES

LUMBER, TIMBER PLYWOOD—PER M FT., B.M., CARLOAD LOTS F.O.B

	SHORT LEAF YELLOW PINE AND DOUGLAS FIR — All S. L. Y. P. is No. 2 common or better and for No. 1 N. C. Box. (Prices in Bold Face) *All Fir planks No. 2 common, Fir timber is No. 1 common. Lengths up to 20 ft. (Prices in italics)*									LONG LEAF Y. P. Merchantable grade up to 20 ft.		PLYWOOD Rail freight increment (See note for base price)	
	1x6 S4S	1x8 S4S	2x4 S4S	2x6 S4S	2x8 S4S	2x10 S4S	3x12 Rgh	6x12 Rgh	12x12 Rgh	2x12 Rgh	12x12 Rgh	3/8"	1/4"
Atlanta	**$29.00**	**$28.00**	**$29.00**	**$27.00**	**$28.00**	**$29.50**	**$40.00**	.....	.....	$60.00	$70.00	$17.90	$21.85
Baltimore	**40.00**	**42.00**	**40.00**	**40.00**	**41.00**	**44.00**	**60.00**	.....	.....	110.00	115.00	18.25	22.25
	45.00	*46.00*	*52.00*	*52.00*	*52.00*	*52.00*	*68.00*	*$72.00*	*$72.00*	.....	.....	.....	.....
Birmingham	**34.50**	**34.50**	**32.00**	**32.00**	**32.00**	**34.00**	**53.00**	**53.00**	**56.00**	.....	.....	17.35	21.15
[1]	37.50	37.50	37.00	37.00	37.00	43.00	65.00	.....	.....	67.50	70.00	.....	.....
Boston ‡*	70.00[2]	70.00[2]	60.00[2]	60.00[2]	87.00[4]	100.00[4]	115.00[4]	.....	.....	115.00	130.00	18.25	22.25
‡*	*55.00*	*55.00*	*60.00*	*65.00*	*65.00*	*80.00*	*85.00*	*85.00*	*85.00*	.....	.....	.....	.....
Chicago	**42.00**	**43.00**	**41.00**	**40.00**	**41.00**	**42.50**	**60.00**	.....	.....	80.00	95.00	14.60	17.80
	46.00	*46.00*	*47.50*	*47.00*	*47.00*	*48.00*	*67.00*	*66.50*	*66.50*	.....	.....	.....	.....
Cincinnati	**41.00**	**42.50**	**39.00**	**40.50**	**42.00**	**43.00**	**53.00**	.....	.....	65.00	68.00	17.35	21.15
	.....	.....	.....	.....	.....	.....	*55.50*	*55.50*	*55.50*	.....	.....	.....	.....
Cleveland	**42.50**	**43.50**	**41.50**	**43.50**	**45.00**	**47.00**	**53.00**	**57.00**	**57.00**	90.00	93.00	17.75	21.60
Dallas e	**39.50**	**40.50**	**39.50**	**38.00**	**38.50**	**39.50**	**53.00**	**53.00**	**53.00**	78.00	83.00	14.60	17.80
Denver ‡	54.00[4]	52.00[4]	55.00[4]	55.00[4]	55.00[4]	56.00[4]	59.00[4]	*78.00*	*79.00*	.....	.....	10.45	12.70
Detroit	**44.00**	**44.00**	**44.00**	**43.50**	**44.00**	**46.00**	**60.00**	.....	.....	53.00	63.00	17.35	21.15
	.....	.....	.....	.....	.....	*51.50*	*55.00*	*60.00*	*60.00*	.....	.....	.....	.....
Kansas City	**50.00**	**55.00**	**52.00**	**52.00**	**52.00**	**55.00**	**65.00**	.....	.....	75.00	85.00	12.60	15.40
	50.00	*55.00*	*52.00*	*52.00*	*52.00*	*55.00*	*65.00*	*80.00*	*80.00*	.....	.....	.....	.....
Los Angeles c	*55.00*	*55.00*	*53.00*	*53.00*	*51.00*	*51.00*	*57.00*	*66.00*	*56.00*	.....	.....	9.90h	12.05h
Minneapolis ‡b	49.00[3]	49.00[3]	.....	.....	.....	.....	.....	.....	.....	.....	.....	12.60	15.40
‡	*53.00*	*53.00*	*53.00*	*52.00*	*52.00*	*53.00*	*59.00*	*61.00*	*61.00*	.....	.....	.....	.....
Montreal †[7]	*43.00*	*46.00*	*42.00*	*45.00*	*47.00*	*54.00*	.....	.....	.....	200.00	200.00	.....	.....
	42.50	*42.50*	*45.25*	*47.25*	*48.25*	*48.75*	*50.75*	*50.75*	*50.75*	.....	.....	.....	.....
New Orleans	**31.50**	**31.50**	**33.75**	**31.75**	**34.00**	**35.00**	**48.00**	.....	.....	69.00	69.00	14.60	17.80
	31.00	*31.00*	*33.00*	*31.00*	*34.00*	*32.00*	*33.00*	.....	.....	.....	.....	.....	.....
New York ‡	**50.00**	**51.00**	**51.00**	**50.00**	**51.00**	**54.00**	**62.00**	.....	.....	120.00f	125.00f	18.35	22.25
‡	.....	.....	*65.00i*	*65.00i*	*65.00i*	*65.00i*	[Range from $75 to $95]			.....	.....	.....	.....
Philadelphia	**48.00**	**49.00**	**48.00**	**48.00**	**49.00**	**52.00**	**54.00**	.....	.....	82.00	87.00	18.25	22.25
	54.00	*54.00*	*65.00*	*65.00*	*65.00*	*65.00*	*67.50*	*75.00*	*75.00*	.....	.....	.....	.....
Pittsburgh	**50.50**	**53.20**	**62.75**	**55.00**	**60.85**	**62.50**	**76.25**	.....	.....	.....	.....	18.10	22.05
	69.20	*68.10*	*66.10*	*65.30*	*65.20*	*65.65*	*88.75*	*88.75*	*88.75*	.....	.....	.....	.....
St. Louis ‡c	**49.00**	**49.00**	**46.50**	**45.50**	**47.50**	**50.00**	**64.50**	*71.00*	*71.00*	81.00	70.00	14.60	17.80
San Francisco d	*55.50*	*55.50*	*57.00*	*57.00*	*56.50*	*56.50*	*40.50*	*49.50*	*49.50*	.....	.....	7.30g	8.90g
Seattle	*55.00*	*55.00*	*55.00*	*55.00*	*55.00*	*55.00*	*40.00*	*40.00*	*40.00*	.....	.....	0.00	0.00

Bold Face type, Southern Pine. *Italics, Douglas Fir.* [1] Long leaf. [2] Roofers' N. C. Pine. [3] Spruce. [4] Native. [5] Western Pine, No. 3 Common. [7] Spruce. [8] Norway Pine. ‡ Delivered. a Yard prices. b Contractors discount in Minneapolis and St. Paul discontinued May 21, 1938. c 5M ft. or less. d F.o.b. cars San Francisco freight rate. e 10% discount taken off. f Up to 18 ft. † Plus sales tax. * Prices for truck delivery; no longer quoting carload lots f. o. b. city.

Note: Special concrete form grade Fir Plywood, 4' by 8' panels, 5-ply, sanded 2 sides, water resistant glue, carload lots, delivered per 1,000 sq. ft. surface. Seattle base price on 3/8", $86.50; on 1/4", $95.30; price includes oiling and sealing charges. For other centers add rail freight increment from table or proper size. For resin dipped treatment, add $10.50 per M. g Lower rate by water shipment. h 50,000 lb. minimum. i Ranges from $65 to $69.

GLASS, EXPLOSIVES, CHEMICALS

	WINDOW GLASS — Discounts from jobbers list, Aug. 15, 1938 Single or Double Thickness A quality	B quality	EXPLOSIVES — Per lb. 40% Ammonia Gelatin in 50-lb. cases delivered in 200 lb. lots*
Atlanta	75%	75%	$0.15
Baltimore	78%	79%	.15
Birmingham	76%	76%	.105
Boston	77%	78%	.15
Chicago	77%	77%	.15
Cincinnati	77-10%	77-10%	.15
Cleveland	77%	77%	.19
Dallas	76%	76%	.1625
Denver	76%	76%	.155e
Detroit	77%	77%	.15
Kansas City	76-10%	76-10%	.155
Los Angeles	86%d	88%d	.1575
Minneapolis	77%	77%	.155
Montreal	40-5%‡	47%‡	.1675†
New Orleans	70%	75%	.16
New York	81%	82%	.22f
Philadelphia	78%	79%	.15
Pittsburgh	79%	79%	.1225
St. Louis	76-10%	76-10%	.155
San Francisco	66-15%	73-15%	.155
Seattle	75%	75%	.1575†

Price of 60% Ammonia Gelatin in $0.01 per lb. higher than 40%

a Disc. from list Sept. 1939. b Also less 6% tax exemption. d Discount from jobbers' list Sept. 15, 1928. ‡ Plus sales tax.

* Urban prices influenced by service charges or local storage and delivery regulations, do not consistently reflect quantity prices in less congested areas. e F.o.b. Louviers, Colo. f In boroughs of Kings, Queens and Richmond, and in Manhattan south of Canal Street, add delivery charge of $6.00 per trip. † F.o.b.

40% Ammonia Gelatin price ranges in other than urban areas, per lb. (except Seismograph Grades)

	C/L 20,000 lb. net	Tons	200 lb. lots
E. of the Miss., except Fla. and Me.	$0.105	$0.13	$0.15
W. of Miss. to Rocky Mtn. States, Fla. and Maine	.11 -.1175	.135 -.1475	.155 -.1675
Rocky Mtn. States	.11 -.1225	.135 -.1525‡	.155 -.1725‡
Pacific N. W. States	.1075-.12	.1375-.15	.1575-.17
Pacific S. W. States	.1050-.1125	.135 -.1425	.155 -.1625

‡ F.o.b. Louviers, Colo., or Butte, Mont.

PILES, TIES — F.O.B.

PILES

Prices per linear foot, pine, with bark on, f.o.b. New York; delivered from barge 1½ to 2c. per ft. additional:

Dimensions	Points	Length	Short Barge	Leaf Rail
12 in. at butt	6 in.	30 to 50 ft.	$0.23	$0.26
12 in.— 2 ft. from butt	6 in.	50 to 59 ft.	.26	.28
12 in.— 2 ft. from butt	6 in.	60 to 69 ft.	.31	.33
14 in.— 2 ft. from butt	6 in.	50 to 69 ft.	.28	.33
14 in.— 2 ft. from butt	6 in.	70 to 79 ft.	.31	.37
14 in.— 2 ft. from butt	5 in.	80 to 85 ft.	.40	.48
14 in.— 2 ft. from butt	5 in.	85 to 89 ft.	.45	.53

RAILWAY TIES

Prices f.o.b., per tie for carload lots:		6"x8"x8' Untr.	6"x8"x8' Tr.	7"x9"x8'6" Untr.	7"x9"x8'6" Tr.
Boston	Oak	$1.30	....	$1.80	....
	Pine	1.60	$2.40a	2.40	$3.40a
New York	S. L. Sap Pine	1.43/1.54	2.59	1.76	2.86
	Mixed Oak	1.71	2.59	2.20	3.25
Birmingham	White Oak	1.00	1.60a	1.30	2.25a
	Southern Pine	....	....	....	....
Chicago	Red Oak	....	2.40a	....	3.00a
	Southern Pine	....	....	....	....
Los Angeles	Douglas Fir	1.10	1.75a	1.60	2.50a
Philadelphia	Red Oak	....	2.10a	....	3.25a
St. Louis	White Oak	1.65*	....	1.90*	....
	Red Oak	1.55*	2.15a*	1.90*	2.70a*
	Sap Pine or Cypress	1.35*	....	1.70*	....
San Francisco	Douglas Fir	1.15bef	....	....	3.00caf
Montreal	Birch or Maple	.85	.95	....†	....†

Tr.— Treated; Untr.— Untreated. a Creosoted. b 6" x 8 x 8'6". c Empty cell. d Zinc. e Green. f F. o. b. cars. † Out of market. * September price, none later available.

CHEMICALS

Water, sewage treatment road work, f.o.b. carlots, New York

Bleaching powder, in drums, f.o.b. works, per 100-lb	$2.25- 3.10
Chlorine cylinders, liquid, per lb. delivered	.0525
Calcium chloride, 77-80%, flaked, in 100-lb. paper bags, delivered, per ton	18.50-35.00
Silicate of soda, 52 deg., in drums, f.o.b. works, per 100 lb	1.40
Soda ash, 58%, in paper bags, per 100 lb. dense	1.15
Sulphate of aluminum, commercial, in 100-lb. bags, per ton	23.00-25.00
Sulphate of copper, in bbl., per 100-lb	5.15- 5.50

NO GUESSWORK . . . .

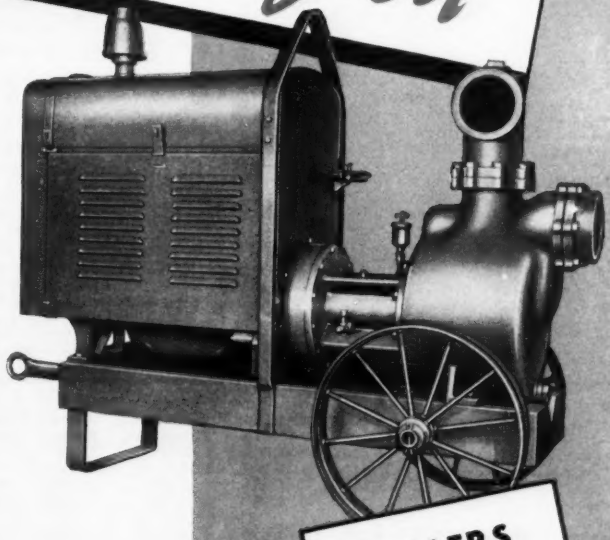
Every Carver pump gets a performance test like this before shipment. Conformance with AGC standards, with our capacity ratings, is thoroughly checked . . . all in addition to rigid inspections for accuracy and quality at every stage of manufacture.

CARVER PUMPS are Certified

YOU *know* what a Carver pump will deliver *before* you buy one, because Carver performance is *certified*. Every pump is thoroughly checked for performance at the factory . . . when it gets to your job, you can be sure it fully conforms to AGC specifications and our own high performance standards.

On construction jobs all over the world, Carver pumps are setting records for steady, unfailing performance under all conditions . . . handling jobs too tough for other pumps, staying on pump-killing jobs month after month without a let-down.

Capacities range from 5,000 to 120,000 GPH, gas-engine or electric motor-driven, in a variety of portable and stationary mountings. Prompt deliveries on orders carrying A-1-C or better priorities . . . write, wire or phone for full information.



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Carver's complete pump line is available to aggressive dealers in several U. S. territories. Ample plant capacity assures prompt service; full support with extensive advertising and sales helps offered. Write or wire for details of Carver dealership plan.

CARVER PUMP CO.
Muscatine
Iowa

CARVER CENTRIFUGAL *Certified* PUMPS

STRUCTURAL CLAY BUILDING TILE, BRICK AND LIME—DELIVERED

	STRUCTURAL CLAY TILE—PARTITION—SCORED Per M. lots of 2,000 pieces or over, 3x12x12 in.	4x12x12 in.	8x12x12 in.	STRUCTURAL CLAY TILE—LOAD BEARING—SCORED Per M. lots of 2,000 pieces or over, 8x12x12 in.	10x12x12 in.	12x12x12 in.	BRICK Per M. in quantity. Common backing	Straight hard	LIME Per ton, Hydrated finishing	In paper, Common hydrated	Carload lot, Pulverized or lump
Atlanta	$104.00	$114.00	$199.00	$234.00	$244.00	$250.00	$13.50	$18.04	$26.54	$15.04	$15.04
Baltimore	84.00	90.00	170.00	200.00	260.00	320.00	15.00k	19.00k	18.00	13.00	2.50m
Birmingham	80.00	85.00	160.00	191.00	252.00	288.00	14.50	17.00	18.11	13.64	2.25le
Boston	89.35a	93.30a	178.70a	202.50	271.80	308.20	16.50i	19.50i	17.50†	12.50†	14.92†
Chicago	72.00	77.00	145.00	197.00	243.00	278.00	12.50	13.00	17.00	15.00	12.50
Cincinnati	65.55	69.90	131.20	148.70	210.35	240.45	17.50	17.50	15.50	13.00	.....
Cleveland	60.00	64.00	120.00	144.00	193.00	221.00	17.00	17.00	14.50j	13.25j	3.00jm
Dallas	62.50	67.00	135.00	162.00	212.50	263.00	13.50i	15.00i	19.00	15.00	.95n
Denver	84.80	95.40	153.70	178.20	212.00	227.90	14.50	17.00	25.00j	17.00j	20.00j
Detroit	76.90	81.50	152.80	201.00	262.00	310.00e	17.50	18.00	16.60	14.90	14.60
Kansas City	67.00	69.00	89.00c	128.00	163.00	189.00	15.00	16.00	19.32	13.00	10.92
Los Angeles	73.50fr	89.50fr	128.00cfr	210.00fr	368.00fr	460.00fr	13.50	15.00	16.50	17.50	17.50
Minneapolis	81.00b	86.40b	146.90b	.....	177.00b	246.00b	13.60	15.60g	21.00	16.00	19.00
Montreal	99.10a	105.65a	154.75a	104.65at	154.75au	155.25	22.00tu	27.25tu	24.60u	18.00u	13.00u
New Orleans	72.00	72.00	135.00	162.00	210.00	260.00	14.00	.....	18.30	12.08	14.10
New York	78.40	83.60	115.00c	193.30k	238.80k	295.60k	15.00	.....	20.00	14.00	17.00
Philadelphia	90.00	97.70	183.20	197.10	243.20	301.10	17.00	20.00	15.50	8.55	10.55
Pittsburgh	62.35	66.55	124.75	140.25	173.25	198.00	17.50	19.50	17.90	15.40	2.75m
St. Louis	67.00	95.00	130.00	190.00	244.00	290.00	18.00	17.00	22.00	18.00	18.00
San Francisco	84.00	94.50	225.00	.....	.....	.....	17.50	22.00	20.00	20.00	16.40
Seattle	115.00	125.00	230.00	.....	.....	.....	20.00f	21.00f	20.00s	20.00s	20.00s

† F.o.b. a Smooth. b Carload lots delivered to job. c 6x12x12 in. d Not load bearing. e 48 lb. tile. f Less $1.00, ½ cash 15 days, balance 30 days. g Selected common. k F.o.b. Perth Amboy, N. J. i F.o.b. Warehouse only. j LCL. k $1.00 discount if paid in 10 days. l Lump. m Per bbl., 180 lb. n Per sack 100 lb. o Per bbl., 200 lb. p 280 lb. bag. r 5% discount 10 days. s 2% discount for cash. t 5½x8x12. u Plus 8% sales tax.

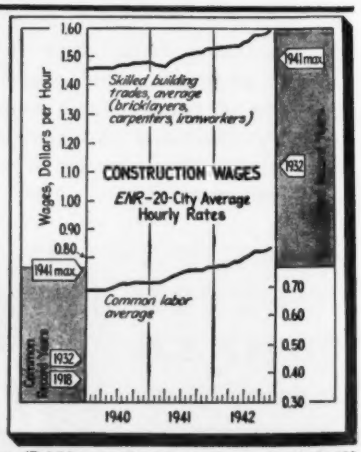
PAINT, ROOFING—F.O.B. CARLOAD LOTS

	RED LEAD Per 100 lb. in 600-lb. (Approx.) bbl. Dry a	WHITE LEAD Per 100 lb. in oil	READY-MIXED PAINT Per gal., drums Graphite b	Aluminum b	Ferric Oxide d	ROOFING SUPPLIES Carload lots f.o.b. factory Rolls, slate surfaced, 85–90 lb. per sq.	Asphalt felt, per 100 lb.	Tar felt, per 100 lb.	Asphalt coating per gal.	Tar pitch 350 lb. bbl. per ton
Atlanta	$10.25	$14.125	$1.30	$2.25	$1.20	$1.90	$1.61	$1.61	$0.27	$29.00
Baltimore	10.00	13.75	2.00	3.00	2.50	2.30	2.70	2.70	.40	29.00
Birmingham	10.25	14.125	2.35	3.50r	1.98r	2.04	1.97	1.97	.32	28.35
Boston	10.00	13.75	1.55	....	2.25	2.12‡	1.72hk‡	1.72hk‡	.50‡	20.00‡
Chicago	10.00	13.75	2.11	2.63	1.72	1.75hf	1.66hf	1.82hf	.33f	23.00f
Cincinnati	10.00	13.75	1.70	2.90	1.60	2.40	2.39hk	2.39hk	.36	21.00
Cleveland	10.00	13.75	2.10	4.80	1.95	1.93	1.83hk	1.83hk	.35	29.00
Dallas	10.00	14.50	1.88	2.11n	.05l	1.75hk	1.66hk	1.66hk	.35	39.00
Denver	10.50	14.25	1.65	....	.27l	2.45	3.15	3.15	.35	28.00
Detroit	10.00	13.75	1.75	3.00	1.60	2.40	2.50	2.50	.35	22.00
Kansas City	10.00	13.875	2.39g	2.55gr	2.16grn	2.10	2.30	2.30	.28	27.50
Los Angeles	10.25	14.25	1.60	2.25	2.30	2.10	1.50	....	.45	.....
Minneapolis	10.00	13.875	....	....	....	1.75i	1.66hki	1.66hki	.32	23.00
Montreal	9.25	6.25	2.85p	4.70p	2.70p	2.85	2.58	2.07	.63	1.85h
New York	10.00	13.75	2.05	2.55	1.64	1.66	1.58hk	1.58hk	.26	25.00
Philadelphia	10.00	13.75	....	....	....	1.75	1.66	1.66	.32	23.00
Pittsburgh	10.00	13.75	1.05	1.95	.80	1.95	1.94hk	1.94hk	.34	26.00
St. Louis	10.00	13.75	2.28	2.89	1.96	1.65	1.66	1.66	.28	23.00
San Francisco	10.25	14.00	1.80	2.75n	1.35/2.35	1.71	2.40	2.40	.33	19.50
Seattle	10.25	14.25	1.90	3.00	....	2.15	2.16hk	....	.35	26.50j

‡ Delivered. Note: Red lead in oil 50c. higher than white lead in oil. a Red lead prices change frequently due to pig lead price changes. b U. S. War Dept. Spec. 3-49A. c ASTM Spec. D266-31. d 80% minimum ferric oxide. e Subject to 25% discount. f Distributors' price to contractors. g 5 gal. can. h Per roll, 65 lb. i Minneapolis and vicinity. j Asphalt pitch. k Per 100 lb. l Per lb. m Per bbl. n May, 1941 price, no later quotation available. p Plus 8% sales tax. r Not available, except on priority rating; then quoted specially.

SKILLED AND COMMON WAGE RATES—PER HOUR

	Bricklayers	Carpenters	Struct. Iron Workers	Hoisting Engineers	Plasterers	Common Labor Building	Common Labor Heavy Const.
Atlanta	$1.375	$1.00	$1.375	$1.00/1.25	$1.25	$0.40	$0.50
Baltimore	1.625	1.375	1.80	1.625/1.80	1.50	.70	.70
Birmingham	1.75	1.125/1.25	1.50	1.25/1.50	1.50	.65	.65
Boston	1.625	1.50	1.65	1.875	1.667	.80/1.00	.80/1.00
Chicago	1.75	1.70	1.76	1.75	1.825	1.10	1.10
Cincinnati	1.75	1.50	1.625	1.40/1.55	1.625	.80	.80
Cleveland	1.75	1.50	1.75	1.75	1.75	1.00	1.00
Dallas	1.625	1.25	1.50	1.75	1.625	.60	.75/1.25
Denver	1.65b	1.50b	1.625b	1.43b	1.51b	.80b	.80b
Detroit	1.675	1.50	1.75	1.625/1.75	1.675	.90	.90
Kansas City	1.65	1.50	1.625	1.625	1.65	.90	.55
Los Angeles	1.50	1.50	1.50	1.50	1.667	.75	.75
Minneapolis	1.50	1.375	1.50	1.40	1.50e	.925	.925
New Orleans	1.50	1.25	1.50	1.375	1.375	.65	.65
New York	2.00b	1.85b*	2.00	2.00b	2.00c	1.031	.95
Philadelphia	1.90	1.50	1.90	2.00	2.00	.825	.825
Pittsburgh	1.90	1.50	1.75	1.5625/1.625	1.75	.80	.70
St. Louis	1.75	1.50	1.75	2.00	1.75	.95	.95
San Francisco	1.875c	1.4375	1.75	1.50	1.75c	.95	.95
Seattle	1.715	1.415	1.615	1.565	1.715	1.015	1.10
Montreal	.965	.855	.90	.80	.945	.505	.505



ENR Skilled Average: (Bricklayers, Carpenters, Ironworkers) $1.599
ENR Common Average: $0.834

b 7 hr. day. c 6 hr. day. d 35 hr. wk. e 30 hr. wk. *Negotiating now for increased rate.

YOUR GUARANTEE GENUINE PARA PURE PARAFFIN BASE WATERPROOF TREATMENT

ALABAMA
Owen-Richards Co., Birmingham
ARIZONA
O. S. Stapley Co., Phoenix
CALIFORNIA
Industrial Equipment Co., Oakland
CONNECTICUT
Gesner Equipment Corp., Hamden
DISTRICT OF COLUMBIA
Hudson Supply & Equipment Co., Washington, D. C.
ILLINOIS
Becker Equipment & Supply Co., Chicago
Joseph Behr & Sons, Rockford
Clark & Barlow Hardware Co., Chicago
INDIANA
Standard Equipment & Supply Co., Hammond
Van Camp Hardware & Iron Co., Indianapolis
IOWA
Hary Alter & Sons, Davenport
Pecant Industrial Supply Co., Sioux City
LOUISIANA
C. T. Patterson Co., Inc., New Orleans
MARYLAND
General Supply & Equipment Co., Baltimore
MASSACHUSETTS
Hedge & Mattheis Co., Boston
Parker-Danner Co., Boston
MICHIGAN
Eddy & Cuthbert, Lansing
C. L. Gransden & Co., Detroit
MINNESOTA
Equipment Rental & Sales Corp., Minneapolis
Thorman W. Rosholt Co., Minneapolis
MISSISSIPPI
Contractors Material Co., Jackson
MISSOURI
Brown-Strauss Corp., Kansas City
Machinery & Supplies Co., Kansas City
The Victor L. Phillips Co., Kansas City
NEBRASKA
Anderson Equipment Co., Omaha
NEW JERSEY
Dale & Rankin, Inc., Newark
NEW MEXICO
Chas. Ilfeld Co., Albuquerque
NEW YORK
Keystone Builders Supply Co., Rochester
New & Used Equipment Co., Long Island
Syracuse Lumber Co., Syracuse
Trevor Corp., Buffalo
J. H. Welch Company, Inc., Buffalo
R. B. Wing & Son Corp., Albany
NORTH CAROLINA
Constructors Supply Company, Inc., Durham
Contractors Service Co., Charlotte
OHIO
Beck Supply Co., Columbus
Construction Equipment Corp., Cincinnati
Moriarty Machinery Co., Toledo
The W. T. Walsh Equipment Co., Cleveland
OKLAHOMA
The Victor L. Phillips Co., Oklahoma City
Mideke Supply Co., Oklahoma City
OREGON
Woodbury & Company, Portland
PENNSYLVANIA
Austin Supply Co., Philadelphia
Dravo-Doyle Co., Pittsburgh
Howard W. Read Corp., Philadelphia
VIRGINIA
Noland Company, Inc., Newport News
Benj. T. Crump Co., Inc., Richmond
WEST VIRGINIA
West Virginia Tractor Equipm't Co., Charleston
WISCONSIN
Hunter Tractor & Machinery Co., Milwaukee

CO. YOUR GUARANTEE GENUINE PARA PURE PARAFFIN BASE WATERPROOF TREATMENT

New Aids to the Constructor

MANUFACTURERS' ANNOUNCEMENTS OF SNOW HANDLING MACHINES

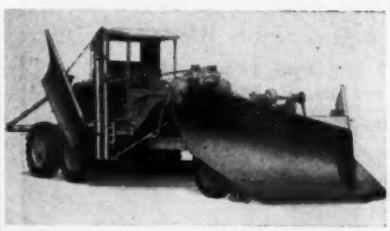
The Rotary Snow Plow Company, Minneapolis, Minn.

The "Snow King" rotary plows are built in one-way, single-rotor units and in V-type double-rotor plows to be mounted on tractors or four-wheel-drive trucks. The rotors throw the snow by centrifugal force high into the air where it floats away making no banks or ridges. The newest unit is a truck-mounted, double-rotor machine said to have all the elements necessary to do the most efficient, economical job possible under toughest operating conditions. The plow

point penetrates the hardest drift, breaks up and rolls the snow to the rotors. The shovel-type rotors cut a swath their own width and this with snow from the V plow is hurled up and away through the chute. The rotors are powered separately leaving the truck motor free to drive the unit forward. The tractor-mounted unit is powered by the tractor motor and is so arranged that it can be interchanged with bulldozer or trailbuilder blades and operated from the same frame.

J. D. Adams Co., Indianapolis, Ind.

Adams makes one-way and V-type snow plows for use with Adams motor graders. The one-way plows are available in both rigid and reversible types with cutting edge lengths of 10 to 11 ft. The V plow is a large capacity implement with a high lift curvature that raises the snow



almost 5 ft., deposits it to the side and well on top of the surrounding snow. Also available for side mounting on the grader is an adjustable height wing. Both the plow and the wing are operated from the cab by mechanical means and the entire unit is streamlined for fast action in snow. The regular blade of the patrol grader can be used for supplemental work and the leaning-wheel feature of the Adams graders is advantageous in overcoming side stress.

Caterpillar Tractor Co., Peoria, Ill.

Besides being the dependable motive power for many other hauling units, the tractor with bulldozer or trailbuilder blade is itself a powerful and useful snow mover. The machine shown, with 10-ft. trailbuilder worked 7 hours on less than 3 gal. of low-cost fuel oil, in snow 4 to 6 ft. deep. Such units are valuable around airports for auxiliary work and especially in close quarters around protective dispersal cribs where planes are stored.

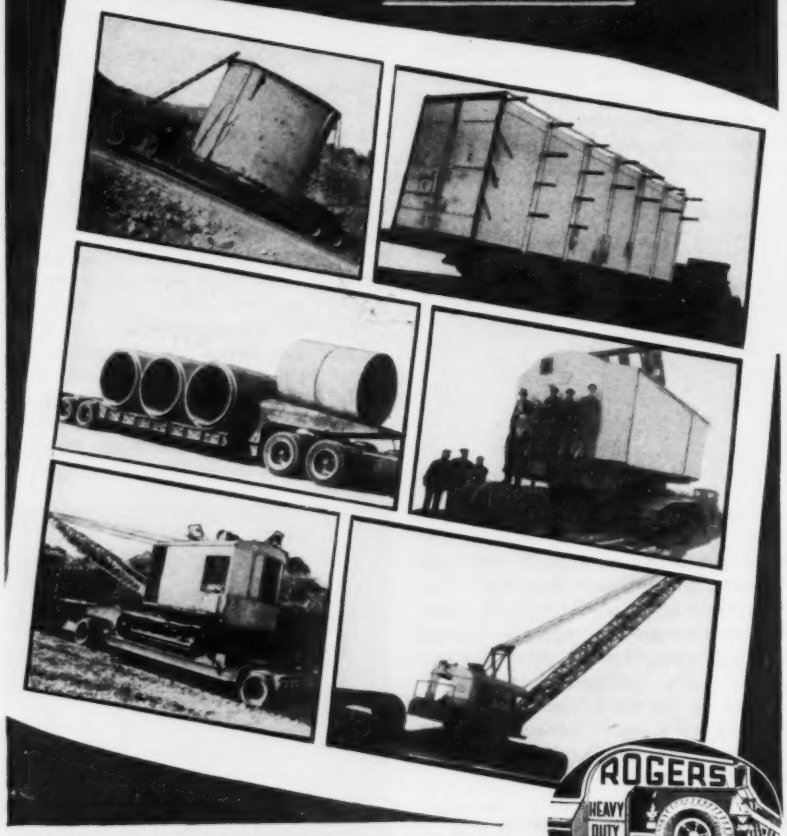
Caterpillar diesel motor graders are offered in three sizes equipped with correctly built snow plows and are known for fast, low-cost removal of snow. Cabs are fitted with adequate heaters, lighting systems and other facilities for conveni-

ence and comfort of the operators. Easy starting in extreme weather is insured by a built-in gasoline starting engine that has ample continuous power to crank the diesel.

Wausau Iron Works, Wausau, Wis.

Designed to "throw snow over the fences", the Wausau line of V, one-way plows and wings are available in various sizes for all capacities of trucks. Various models of the V and one-way plows are made interchangeable on the same frame

When BIG LOADS are MOVED
ROGERS TRAILERS
are PROVED



ROGERS BROTHERS CORP.
135 Orchard St., Albion, Pa.

ROGERS HEAVY DUTY Gooseneck Trailers

TIME-TESTED JOINTING COMPOUND
for Bell and Spigot Water Mains

10 REASONS FOR USING

1. One lb. HYDRO-TITE equals 4 lbs. lead.
2. Stands any pressure the pipe can.
3. Joints showing seepage will take up.
4. Requires no calking as speeds job
5. Anyone can make tight joints.
6. Permanent as the pipe itself.
7. Stands deflection and vibration.
8. 30 years without a failure.
9. Shipped promptly.
10. Demonstration without charge.

***Write for* JOINTING BOOK**

See page 109 FIBREX, our new sanitary packing

HYDRAULIC DEVELOPMENT CORP.
50 CHURCH STREET — NEW YORK, N. Y.

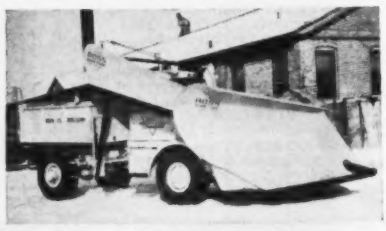
so that the most efficient plowing unit for a particular snowfall can be used. Designed for operation at about 20 mph, a rigid one-way blade plow, Model B-31 & B-31W throws all of the snow picked up well to the side of the machine. This has the advantage of leaving no banks for highway or airport plowing.

Barber-Greene Co., Aurora, Ill.

Loaders are this company's specialty in the snow-handling field. The machines are moved by their own power and backed into windrowed snow for rapid loading of trucks for disposal off the streets. A notched spiral loading wheel throws the snow to an endless conveyor belt that carries snow to above truck-loading and the machine may be equipped with shuttle conveyor for side discharge if desired. The snow-loading machines have capacities of 10 cu.yd. per min. and are so designed that they may be converted to loading machines for sand, gravel and other bulk materials in the warmer months.

The Burch Corporation, Crestline, Ohio.

Ross snow plows are scientifically designed to meet all needs of snow removal as learned from the experience of Burch engineers in actual plowing operations in the snow belt of North America. All types and mountings of plows are available for highway and airport work and for connection to trucks, patrol graders and tractors. Wings are available for use with either of the V or one-way plows and are adjustable from contact with the surface to many feet above it. Wings are available in either front or center-mounted models. The Ross plow features a conical shaped mold board which lifts and rolls the snow rather than bulldozing it and is designed to eliminate side drafts making a truck easy to steer.

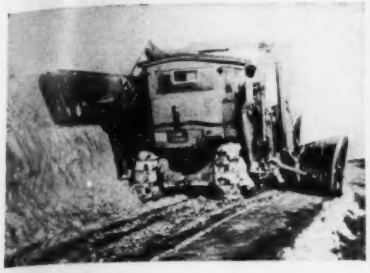


Burch manufactures a sander that can

be used with any size truck by hooking it over the rear tailgate and a trailer unit that can be attached to the truck and towed along on its own wheels to furnish motive power for the spinner.

LaPlant-Choate Manufacturing Co., Cedar Rapids, Ia.

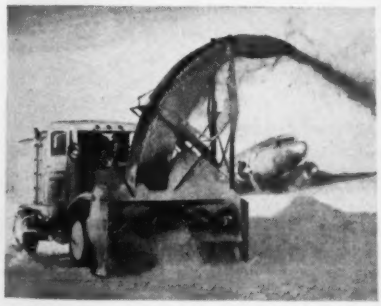
There is a La-Plant-Choate snow plow for every "Caterpillar" tractor, and they are sold and serviced throughout the



world by the combined Caterpillar Tractor Co. and La-Plant-Choate Mfg. Co. organizations. The design of the blade and wings has been arrived at after years of observation and study and insure that the snow is carried upward and outwards and banked correctly by the wings. Every plow is designed for use on only one model of the Caterpillar tractor and is proportioned so that both operate at top efficiency. Mounting and hydraulic control for all the equipment are interchangeable so that the tractor that is needed for snow removal work in the winter can be used with a bulldozer trail-builder, or other tools through the rest of the year.

Klauer Mfg. Co., Dubuque, Iowa.

Snogo is standard equipment of many highway departments and on a great many airports throughout the country. The business end of the Snogo machine consists of a row of three augers that



carry the snow to a central opening in the plow itself. Here the snow is picked up by a high-powered fan and discharged at a high speed to dissipate it over a wide area. The plow is driven by its own engine through a transmission of many speeds. All controls are in the cab and discharge can be raised or lowered or moved to either side at will. The plows

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the Mobile Units of Our Armed Forces

Lubrication of trucks, jeeps, tanks, planes and all other mobile units — inflating tires — pumping gas — powering repair units — these are but a few of the scores of jobs on which Briggs & Stratton instant-starting gasoline motors are now doing their part—furnishing dependable power to speed up this work with our armed forces everywhere.

In the War Program of the United Nations, Briggs & Stratton 4-cycle, air-cooled motors are now giving the same kind of service that has made them world famous — "preferred power" wherever gasoline powered equipment is used.

If you are now planning post-war production of gasoline powered equipment, we would appreciate the opportunity of consulting with you.

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GASOLINE MOTORS

Speed

a must for war work -that's why you need

SMITH AIR COMPRESSORS

★ Lightweight ★ Flexible ★ Move them easily from one job to another

Here's a way to speed-up your work—to save money! Replace large, cumbersome compressors with lightweight Smiths for a majority of compressor operations. 60 cu. ft. size uses only 1 gal. of gasoline an hour. Made with FORD MOTORS and standard parts, the ruggedness and efficiency of these famous compressors are sources of constant satisfaction to users everywhere. Wire, phone or write today for complete information!

With a Ford Motor and shop facilities you can assemble your own Smith Compressor. We will furnish a Smith Compressor Head and Accessories with complete instructions for mounting.

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438 College St. Bowling Green, Ky.

come in a range of sizes suitable for 1½ ton Marmon-Herrington four-wheel drive Ford conversion job, to the largest four-wheel drive type of truck.

Where desired a truck loading device can be provided but usual airport practice is to take advantage of the power with which the unit throws the snow to get it outside the landing areas.

Marmon-Herrington Co. Inc., Indianapolis, Ind.

Marmon-Herrington converts a standard Ford truck to an all-wheel-drive that is very effective for powering handling units, either plows or rotaries. In changing the Ford unit the original front axle is removed and a driving front axle installed with standard Ford differential gears, and with a special Marmon-Herrington design steering end to permit front wheel steering. An auxiliary two-speed transmission is installed and necessary changes made in the steering assembly and hydraulic brake connection.

Wm. Bros Boiler & Mfg. Co., Minneapolis, Minn.

Bros manufacture a rotary plow for mounting on a truck and using separate engine drives. The fundamental design is a double-V plow with an unusual rake on the front designed to eat its way through drifts breaking up packed or frozen snow and delivering it to the rotors without placing any strain on the truck. It is available in two models for mounting on four-wheel drive trucks of 3-ton and 7-ton capacity respectively. Both models are equipped with full power hydraulic controls operated from the cab and are designed to discharge to either side or to load trucks as required.

Bros also feature a one-way plow for patrol work that has the side draft fully balanced and a V plow designed to push easily through the deepest drifts of frozen or wet snow. The V plow has a safety hitch that keeps the plow always level and spring deflectors to permit speed plowing with safety.

Niagara Screen & Machine, Ltd., Toronto, Ontario

The Niagara rotary centrifugal snow plow has a massive one-piece crusher,

cutter, pulverizer and this same device carries the snow, ice or slush to a central, centrifugal thrower. The machine will clear drifts up to 5 ft. high in a single forward movement and has a hydraulic controlled spout with regulating mechanism governing both the weight and direction of discharge. The machine eats into the snow or ice without requiring large pushing power, thus permitting its mounting on smaller trucks. Four models are available with capacities of 100 to 220 cu.yd. per min. capacity, recommended for mounting on any good two-ton truck; and a 440 cu.yd. per min. capacity, using a 400 hp. motor that requires mounting on a 4-ton truck.

Solvay Sales Corporation, New York, N. Y.

Sleet, freezing rain, sheet or glaze ice cause hazards on airports that can be minimized through maintenance by applying a mixture of calcium chloride and relatively sharp, coarse sand or cinders over the affected area. Bulletin No. 47 describes ice control methods on airport runways recommended by the CAA and a booklet is available on methods, materials and equipment for general ice control.

Discussing the reluctance of some airports to use calcium chloride on account of its possible oxidation effect on machines, those familiar with the use of calcium chloride point out that the quantities recommended for airport clearing, are so small as to make a very dilute solution.

The Four-Wheel Drive Auto Company, Clintonville, Wis.

The F.W.D. truck is built so that removing the front bumper provides a convenient, completely drilled, square frame for rigid snow plow mounting that carries the stresses directly into the frame of the truck. The truck has ruggedness,

stamina and has balanced-drive power on all four wheels—a unit that's really made for the tough job of bucking heavy snowdrifts. For different uses, the F.W.D. is available in the H series in four sizes rated from 2 to 3 tons; the U series in three models of from 3 to 6 tons; and the M series, four models with capacities from 6 to 12 tons. The larger series are

powered with 126 to 200 hp. motors, either gasoline or diesel. With the snow plow in place, the F.W.D. truck is designed to carry about ½ of its weight on the front axle and the other half on the rear to insure proper balance for easy handling. The cabs are tight for winter operation and are sealed against carbon monoxide infiltration.

Good Roads Machinery Corporation, Kennet Square, Pa.

Reversible blade plows for one-half to five ton trucks; V plows for 1½ to 10 ton trucks; one-way plows for 1½ to 5 ton trucks and special plows for all kinds of uses are manufactured by Good Roads Machinery Corporation. Also available are sidewalk plows, wings, lifts and other

devices. Good Roads also make a complete line of spreader equipment for abrasives, including a self-powered model that spreads independent of truck speeds and trailer unit geared to the speed of the truck. Featured with the abrasive spreader is a safety seat that remains upright despite the angle of a dump-truck body for the convenience and safety of the operator. Complete truck bodies

Transformed into a SAFETY SECTION by SAFETOP....

THE most vulnerable part of a fire hydrant is immediately above the ground line. This is where breakage occurs when a carelessly backed truck or an automobile out of control smashes into the hydrant.

The Kennedy SAFETOP Fire Hydrant has been specially designed to solve this problem. When struck by an impact which no hydrant could resist, its Safety Breakable Section parts cleanly, protecting the major and expensive parts of the hydrant from damage. There is no flooding—the water service need not be turned off while awaiting or making repairs—replacement parts cost only $6.00—and the hydrant can be returned to service by one man within half an hour and without excavating.

This unique feature and the many other SAFETOP advantages which have won the enthusiastic approval of water department superintendents all over the country are fully explained in bulletin which will be sent on request. Write for your copy today.

THE KENNEDY VALVE MFG. CO.
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SAFETOP
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FIRE HYDRANT

NINE QUICK FACTS FROM THIS NEW BOOKLET

1. By eliminating the need for a boiler plant, these heaters save critical materials, man-hours and money.
2. Dravo Direct Fired Heaters give instant heat when the starter button is pushed.
3. Maximum heat utilization is secured from fuel. All heat except stack loss is utilized.
4. The most economical fuel available for automatic firing, natural gas, light or heavy fuel oil, or coal, is used.
5. Lower maintenace cost due to simplification, such as eliminating freeze-ups, broken traps, leaking valves, etc. No moisture from steam leaks to rust material stored in heated areas.
6. Saving in labor costs; can be operated by maintenance man.
7. The system can be used to furnish summer air circulation. Arrangements can easily be made to provide outside fresh air. Filters can be installed on air intakes.
8. Heat is delivered over an entire floor area or to a localized section with minimum temperature differential between floor and ceiling.
9. These heaters can be installed during building construction for temporary heat. Very little labor is required for their installation.

Bulletin No. 506 contains a complete description of design and construction of Dravo Direct Fired Heaters for gas, oil or coal; also tabular comparisons showing metal and fuel savings which contribute to the war effort. Send for your copy.

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STANDARD DREDGING PUMPS
—FOR GREATER OUTPUT . . .
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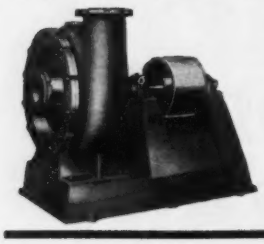


Will efficiently handle all materials from silt and marl to coarse gravel and boulders. Handles large solids without clogging. Stands abuse, long wear. Low in maintenance and power costs. Extra large clearance through impeller and pump—yet won't plug the discharge pipe. Wearing parts made of metal composition best suited to given class of service. Correct hydraulic design and anti-friction bearings for highest mechanical efficiency. In brief, if you want lowest cost per cubic yard of material dredged—a Lawrence is the Pump for you!

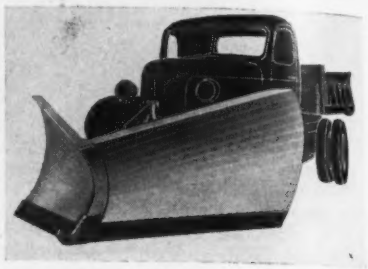
Send for Bulletin No. 209

LAWRENCE MACHINE and PUMP CORP.
369 MARKET ST. LAWRENCE, MASS.

with attached spreading equipment and a large capacity hopper units are available, with a screw conveyor along the bottom of the body feeding to the spreader at the rear of the truck.

Anthony Company, Streator, Ill.

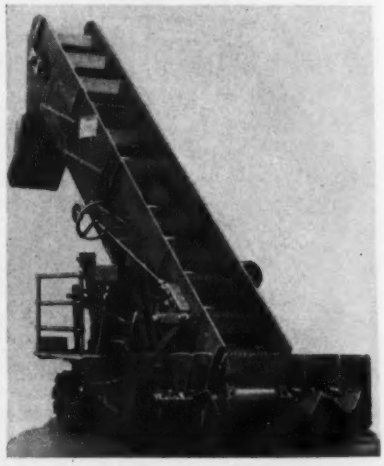
Anthony manufactures a fixed-angle, straight-blade plow, a reversible straight blade, and a V-type plow. These have proven very satisfactory for snow moving, especially in sections where snow is not extremely heavy and more or less wet.



As will be noted in the picture, the mold boards are shaped and formed through a series of shallow breaks, which act to break up the vacuum created by the snow as it slides upward and outward from the mold boards. Another feature of importance on all Anthony plows is that the high carbon steel cutting blade is reversible so that both sides may be used before rebuilding or replacing.

George Haiss Mfg. Co., Inc., New York, N. Y.

Haiss manufactures snow loaders of the self-propelling, self-feeding, digging type that a single operator can handle. Revolving paddles chop their way through frozen or crusted snow and work



the snow to the lifting conveyor. These loaders have capacities up to 10 to 12 cu.yd. per min., and operate most satisfactorily against windrows with cross sections of 15 to 20 sq.ft. Units available this year are the creeper-mounted "75C" type. They have travelling speeds of 70

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Speeds Up Big Concrete Projects!

Excelling in every phase of the batch cycle — *charging, mixing, discharging* — SMITH TILTERS are helping to complete big concrete projects in record breaking time. There are the three TVA projects, for example. Cherokee and Watts Bar Dams completed in 1941 — and Fort Louden Dam, *months ahead of schedule.*

The Smith automatic "straight-flow" feed chute shoots the materials directly to the center of the drum. Mixing is faster because the drum rotates in practically a horizontal position with converging blades producing *a real end-to-center mixing action.* The big drum opening and steep 60° drum tilt assures faster discharge.

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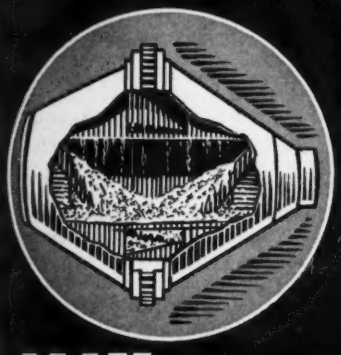
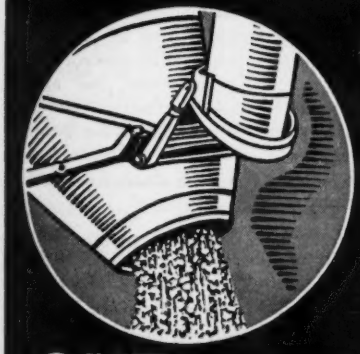
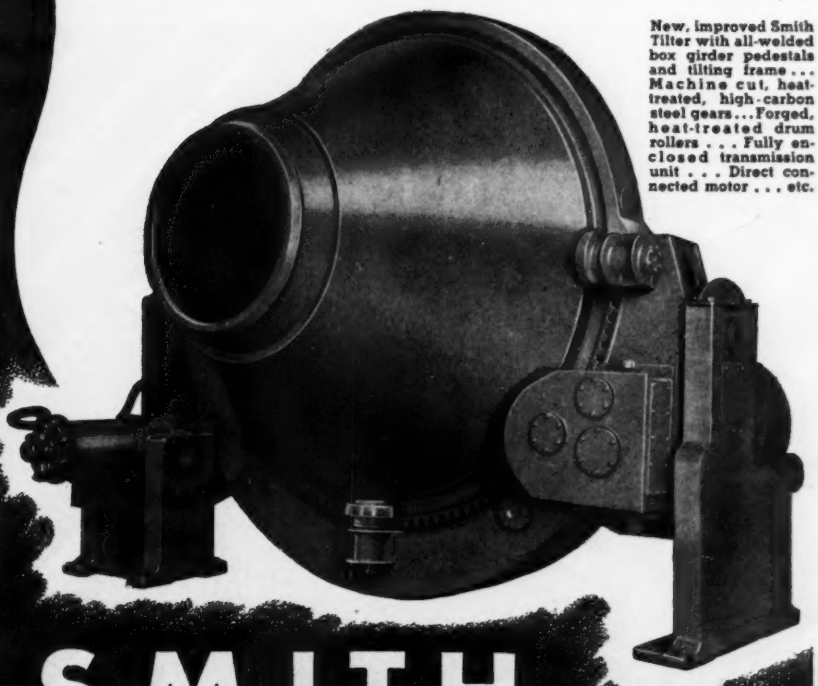


MIX FASTER



OUT FASTER



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ft. per min. towards the pile, and 17 ft. and 125 ft. per min. (1.4 mph.) away from the pile, with a 10-ft. per min. slow speed crowd towards the pile. Such machines are valuable for auxiliary work around airports, particularly in the building area where snow must be hauled away for disposal.

Carl H. Frink Mfg. Co., Clayton, N. Y.

There is a Frink snow plow for every kind of snow and every type of hauling unit. One-way plows are available for clearing a width of 7 to 9 ft. and suitable for mounting on a 2 to 10 ton truck. It is designed to cut under snow and spread it so as not to form side banks that would encourage drifting. Reversible one-way blade plows are available for cutting a path 7 to 9½ ft. wide. These plows are available for use on light trucks, with either single or dual rear tires, with similar models available in sizes suitable for 3 to 5 ton, 4-6 ton, and

5-7 ton trucks. Other Frink units are manufactured for light tractors for sidewalk clearing and from that size on up to units for motor graders and the heaviest crawler tractors. Front and rear mounted levelling wings are made for use with the various types of plow and for both tractor and truck mounting. All units have conveniently located controls for easy handling of the snow moving devices at rapid speed.

W. D. Beath & Son, Ltd., Toronto, Ont.

Frink snow plows, described above, are built by Beath for distribution in Canada. Beath also manufactures an underbody planer with full hydraulic control. It has been especially developed for airport maintenance and is excellent for snow and ice removal as well as for grading.

Baker Manufacturing Company, Springfield, Ill.

There is a Baker for every snow removal requirement and experience to back them in snow handling devices built since 1908. Eight models are available in reversible tripping-blade truck plows which have the cutting edge made in sections any or all of which may deflect on striking a fixed object. One-way landside plows are available in seven models, four with sectional-tripping blades and a mold board shaped to "shoot" the snow

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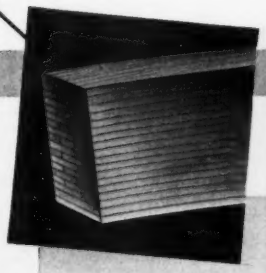
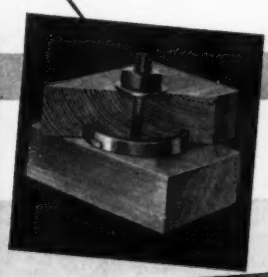
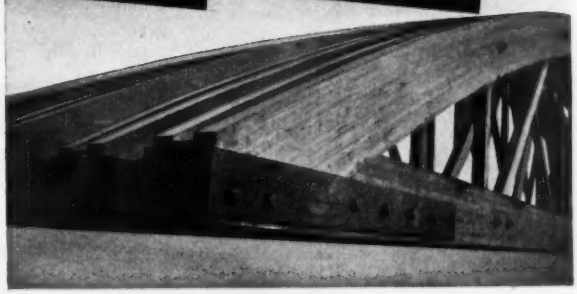


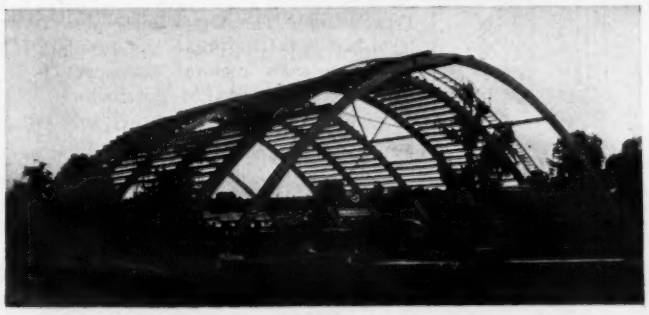




New methods of joining lumber make available to architect and engineer, modern factory fabricated structural members engineered for specific jobs.

Teco Connected Trusses are made for spans up to 100 feet and more. The Teco Connector makes it possible to utilize 80% or more of the working strength of lumber, with a consequent reduction in the size of timbers. Teco metal connectors effect a significant saving in steel by eliminating the use of heavy gusset plates, bolts and rods.

Glued Lamination has changed all former concepts of joining and using timber framing members. Carefully selected kiln dried and seasoned lumber is built-up, shaped, formed and securely and permanently bonded with modern structural glues, into strong, graceful roof supports or structural members that are continuous from foundation to roof peak.

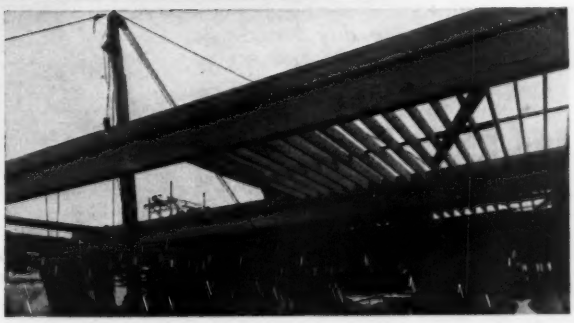


Typical Glued Laminated Bowstring Trusses, Teco Connected.

At Left— Roller Skating Rink, York, Pa. Glued Laminated Parabolic Beam Arches, span 90 ft.

Below— Coca-Cola Bottling Works, Albert Lea, Minnesota. Glued Laminated Ply Beams used in flat roof span 65 feet.

Post-free spans up to 200 feet and over are being built with glued laminated beam arches. Ply beams are being used in flat roof structures of one and two stories. They require no enclosing and lend themselves to unusual finishes.



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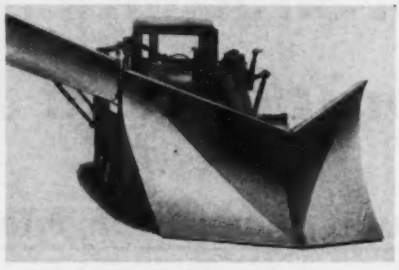
well out of the way. A V-type truck plow is available in four models for 1½ to 5 ton trucks and up.

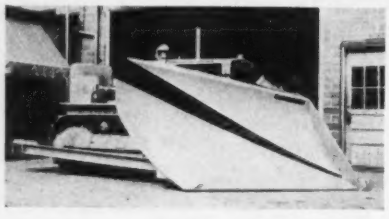
V-type tractor plows are available for a wide range of Allis-Chalmers units, ranging from sidewalk width to the heaviest tractors. The big plows have dual independently-operated side wings that



can be raised or lowered, and held at any arc by full power hydraulic control. Six models are available for speed patrol V-plows for Allis-Chalmers patrol graders. Baker also offers a mold board extension for the Baker grade builders that build this unit up to a sufficient height for handling snow.

Balderson Mfg. Co., Wamego, Kansas.

Balderson snow plows, both reversible and V-type are manufactured for all model Caterpillar track-type tractors, and are also made as attachments for Letourneau Angledozers and Trackson



Traxcavators. The V-type snow plow is furnished for Caterpillar motorgraders. Balderson snow removal equipment is sold through Caterpillar distributors.

Austin-Western Road Machinery Co., Aurora, Ill.

A V-plow is available for mounting on Austin-Western graders with an adjust-

able side wing available if desired. The extra traction of front-wheel drive, directly behind the plow and the rear wheel steering to counteract side thrust controls direction of travel and helps to prevent skidding and all combine to make these units powerful snow movers. Also manufactured are a reversible straight blade plow, a rigid one-way plow, and a V-plow for 1½ to 3-ton trucks. All plows in the same weight class fit the same push frame so are interchangeable.

Walter Motor Truck Co., Ridgewood, L. I., N. Y.

Walter snow fighters, with a unique combination of traction and power, are capable of maintaining a relatively high plowing speed and, equipped with efficient types of snow plows and wings are an effective solution to the problem of clearing airport runways. For general

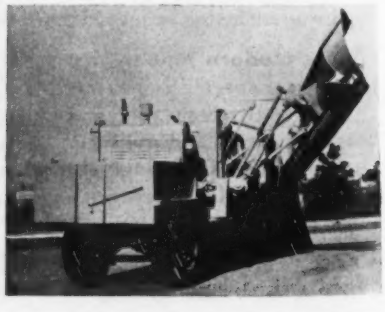
airport clearing, the Model FGBF 175 hp., eight-ton snow fighter is recommended with a one-way speed plow at the front, and a right wing, both hydraulically controlled from the cab.

For deep snow conditions the same truck is recommended with an offset V-front plow and a Roto Wing that has a fast moving rotor mounted in the end of the wing to boost the speed of the snow, and spread it without banks. For extreme ice conditions, the units shown above, with 12-ton truck, one-way speed plow, pressure center scraper blade, and a sand or chemical hopper with paddle-type spreader at the rear is suggested.

The rear view of the Roto Wing unit is shown below mounted on a Walter truck.

Roto Wing Co., Mound, Minn.

The Roto Wing unit, partially described above, is designed primarily for use on the Walter Snow fighter. This unit, using a motor identical with the one on the Walter Truck assisted the big snow fighter to maintain an average speed of 10 mph through snow of 4 ft. depth in tests last Spring. Roto Wing manufactures other plows suitable for mounting on Walter and other truck units.



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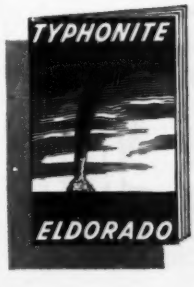
Eldorado's blackouts are always a full success! Each mark, each line is a complete black-eye for that common enemy—MISUNDERSTANDING. When the draughtsman makes his drawing, each inch of it is as he wants it. And it shows up that way on the blueprint! Clear! Distinct! Even! What this means to American production cannot be estimated.

Only Dixon, the makers of Eldorado, are permitted to use the Typhonite process. Through this method, graphite is smashed to minute particles of even size. These make a lead that's smooth, dependable, unerring—the kind you need.



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A little history of pencil-making describes the Typhonite process—it's informative, fascinating. Please write on your professional or business stationery.

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Snow Removal Equipment Company, San Francisco, Calif.

The "Rotoblade" is designed to work by itself on either highway or airport plowing and consists essentially of a one-way plow delivering directly to a rotor that blows the snow well away from the machine. The larger size units will handle 6 to 12 in. of freshly fallen dry snow at a truck speed of up to 25 mph. In some snows, however, the manufacturer recommends use of a blade plow to widen the swath that can be taken. Some models of the Rotoblade have a Ford V-8 95-hp. motor mounted on a frame with the plow and both are pushed ahead by the truck unit. A heavier machine, Model 42, Rotoblade, intended for use with a large four-wheel-drive truck, has the power unit mounted on the truck chassis.

Athey Truss Wheel Co., Chicago, Ill.

The Athey MobiLoader, an overhead-discharge, tractor-mounted scoop is readily adapted to snow handling. It operates in small space because there is no turning to unload. It removes piled snow and quickly loads it into trucks for disposal. Handling rates as high as 330 cu.yd. per hr. are possible. Models are available for mounting on D4 and D8 Caterpillar tractors. Information may be obtained from Caterpillar dealers.

Sicard Limited, Montreal, P. Q.

The Sicard snow-blower unit is designed for attachment to the front of the Sicard four-wheel-traction truck. The recent models of blowers will handle up to 60 tons of snow per minute at truck speeds up to 27 mph. By means of wing attachments to the side of the truck, snow may be windrowed for succeeding passes of the blower clearing a lane 15 or 25 ft. wide at each pass.

This advertisement appeared in a group of newspapers on Tuesday, October 13, 1942

How do you get the cube root of a cow?

READ the newspaper advertisement, reprinted opposite, and you'll see we are telling the public (and government) about the job engineers are doing in stuffing bigger food production into fewer ships.

When you get to that part of the ad that tells about Food Engineers reducing a cow's carcass to the size of a couple of suit boxes, you will have reached the point where McGraw-Hill really lives.

In Food Production, too, it's our job to collect the "how-to-do-it" news on each new advance in technology and equipment, and pass on this information to an entire industry.

The Industrial Press of America implements the exchange of ideas, which is a national characteristic and one of the secrets of our industrial development.

Through the interchange of ideas, made possible by the Industrial Press, the sum of American technical genius is greater than the sum of its parts.

If a food engineer in Illinois learns how to add and control Vitamin A in a food product, all food manufacturers learn how it was done, through a magazine like FOOD INDUSTRIES.*

If a manufacturer develops a new dehydrating machine, production men learn what it will do and how it operates, through the informative and helpful advertising that is characteristic of the Industrial Press.

No matter what your industry or your job, you can probably remember many instances where an industrial magazine has helped you find a solution to a production problem.

But valuable as they are, Industrial Magazines cost only a few dollars per year.

That's why the route slip is so puzzling. If a man needs to see a magazine at all, he should not be under pressure to pass it along.

For help in studying the proper distribution of technical magazines among the men in your organization, write to the Reading Counsellor, c/o McGraw-Hill Publishing Company, Inc., 330 West 42nd Street, New York.

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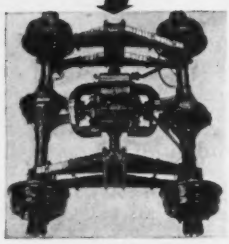
Manufacturers also of the THORNTON automatic-locking DIFFERENTIAL
"When you need TRACTION you need THORNTON"



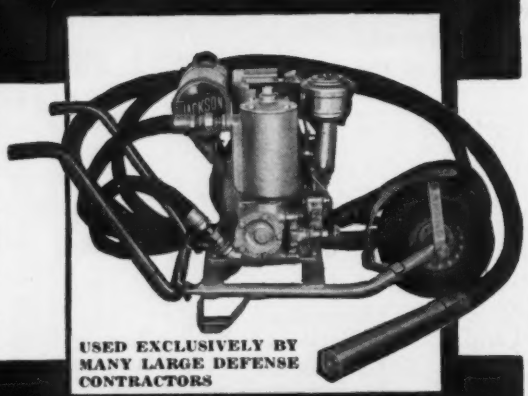
Put TWO driving axles under the load instead of one, double the gear speeds, improve springing and load flotation, gain vastly superior tractive ability.

. . . If you want to make speed profitably . . . GET DEPENDABLE EQUIPMENT . . Buy the Fast . . .

JACKSON Hydraulic Concrete Vibrator

DESIGNED TO "TAKE IT" 3 SHIFTS A DAY—EVERY DAY

- Automatic pressure lubrication—requires no attention.
- 34-ft. hose—2¾" vibrator head.
- Adjustable frequency to 6800 R.P.M.—submerged in concrete.
- Powerful gas engine—4.7 H.P.
- Long-lived, ball-bearing, rotary, hydraulic pump.



USED EXCLUSIVELY BY MANY LARGE DEFENSE CONTRACTORS

ELECTRIC TAMPER & EQUIPMENT CO.
LUDINGTON, MICHIGAN

Heavy-Duty Welder

The new Glenn-Roberts Model 45, a heavy-duty manually-operated welder with a range of from 20 amp. to 625 amp. has been announced. The machine is said to be the first manual welder to offer such a wide range of heats in a single machine. It meets the demand for a genuine all-purpose welder, capable of handling a great variety of jobs from light sheet metal to heavy production work. The manufacturer points out that plants now busy with war orders may employ the G-R 45 for heavy-duty assignments and use it with equal facility at the war's end for lighter jobs. — *Glenn-Roberts Co., 1009 Fruitvale Ave., Oakland, Calif.*

Fire Extinguisher

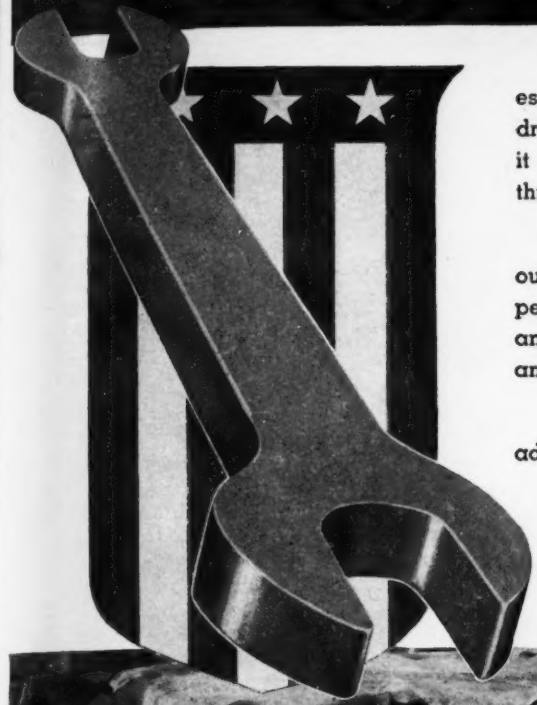
Large alcohol fires, one of the most difficult of all types of fire to control, can now be easily extinguished with Alcofoam, a product of the American-La France-Foamite Corp. Produced from Alcofoam powder, it forms a smothering blanket that snuffs out flames in alcohols, ketones, esters, ethers and a host of other such flammable liquids. It is dependably effective on petroleum fires as well. Poured into any single powder generator, and carried through a water stream, Alcoform powder generates a foam that floats on the lightest surface. Applied at time of fire through fixed connections on storage tanks, or directed through hose and nozzle, it completely cuts off the supply of oxygen necessary to support combustion.—*American-LaFrance-Foamite Corp., Elmira, N. Y.*

Flow Transmitter

The new Cochrane Style H transmitter, used in conjunction with standard Cochrane electrical meter receiving units, is designed specifically for the measurement of low static pressure gases where low differential and resultant low permanent pressure loss is of prime importance. Differential pressure created by flow is applied to the opposite side of the oil sealed bell with the pressure from the connection before the primary element being applied under the bell and the down-stream pressure above the bell. A metallic displacer in the central reservoir is submerged in mercury to a point where the bell and displacer just float when no differential pressure is exerted. A flow of gas resulting in a change of differential pressure raises the bell lifting the displacer from the mercury with the change in buoyancy being sufficient to give a bell movement proportional to the differential pressure.—*Cochrane Corp., 17th & Alleghany Ave., Philadelphia, Pa.*

(*Continued on page* 143)

Adjust Yourself to Victory



To keep your excavator operating efficiently over the longest possible period, adjustments must be made promptly. A dragging clutch not only wears out its band too soon, but it steals power, and may result in unnecessary stresses throughout the parts functioning in the operating cycle.

Improper adjustments may not show up at once in output figures because a skillful operator can often compensate for them. In the long run, however, repair costs and delays resulting from poor adjustments will cut output and increase costs.

The time required to keep all parts of your excavator adjusted correctly will be more than repaid in decreased power consumption and lower maintenance costs.

Follow your manufacturer's recommendations for care and maintenance carefully and you will keep your excavator going at top speed for Uncle Sam.

Bucyrus-Erie

SOUTH MILWAUKEE, WISCONSIN

Enlarged reprints of this ad are available for your bulletin boards. In the reprints, the Bucyrus-Erie signature is omitted to leave room for your own name. Write for your copies

A TRUCK has to have "guts" to stand up in off-the-highway operations in quarries, sand pits and excavations such as this Truckstell-Thornton truck handles every day.

But this unit is a typical example of thousands of Truckstell Converted new and used 1½ ton trucks that are proving the practicability of this method of *"making big ones out of little ones."*

This Truckstell Conversion method, now approved by W. P. B. officials, supplies additional indispensable heavy duty trucks and conserves manpower and critical materials by utilizing the man hours and metal in already completed chassis.

Rugged but powerful and economical trucks are available in four wheel, multi-geared units and six wheelers with driven or trailing third axles; also a "booster" truck with a second engine that cuts in and out automatically to furnish extra power when and as needed. Capacities range from 3½ to 6 tons and up as trucks and 40,000 to 50,000 pounds as tractors.

If you need trucks here is probably your answer so write at once for complete information and the name of the nearest Truckstell Distributor.

THORNTON Four Rear-Wheel-Drive CONVERSION

TRUCKSTELL CLEVELAND

CONVERTERS of TRUCKS for EXPANDED USEFULNESS

DISTRIBUTORS of Tested and Approved TRUCK EQUIPMENT

Hayward Buckets

Use this Class "E" Clam Shell Bucket for handling crushed stone, gravel, sand and other bulk materials.

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DE LAVAL STEAM TURBINE CO. TRENTON, N.J.

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STEAM TURBINES . . . HELICAL and WORM GEARS . . . PUMPS: Centrifugal, Propeller, Clogless, Mixed Flow, Rotary Oil . . . Pump Priming Systems . . . CENTRIFUGAL BLOWERS and COMPRESSORS.

Manufacturers' Activities

The AMERICAN MACHINE AND METALS Co. recently received the Army-Navy "E" production award for meritorious accomplishment.

WALTER H. SHACTON, 56, district manager in Wisconsin for the ALLEN-BRADLEY Co., died in Milwaukee recently.

ERNEST F. HARTMAN, president and founder of the PROTEXOL CORP., Kenilworth, N. J., died recently.

J. O. WETHERBIE has been appointed manager of GENERAL ELECTRIC wiring materials district No. 2, with headquarters at 570 Lexington Ave., New York.

KIELEY AND MUELLER, INC., manufacturers of automatic pressure and level control valves and equipment has expanded its factory in Newark, N. J., to triple the size of the former plant.

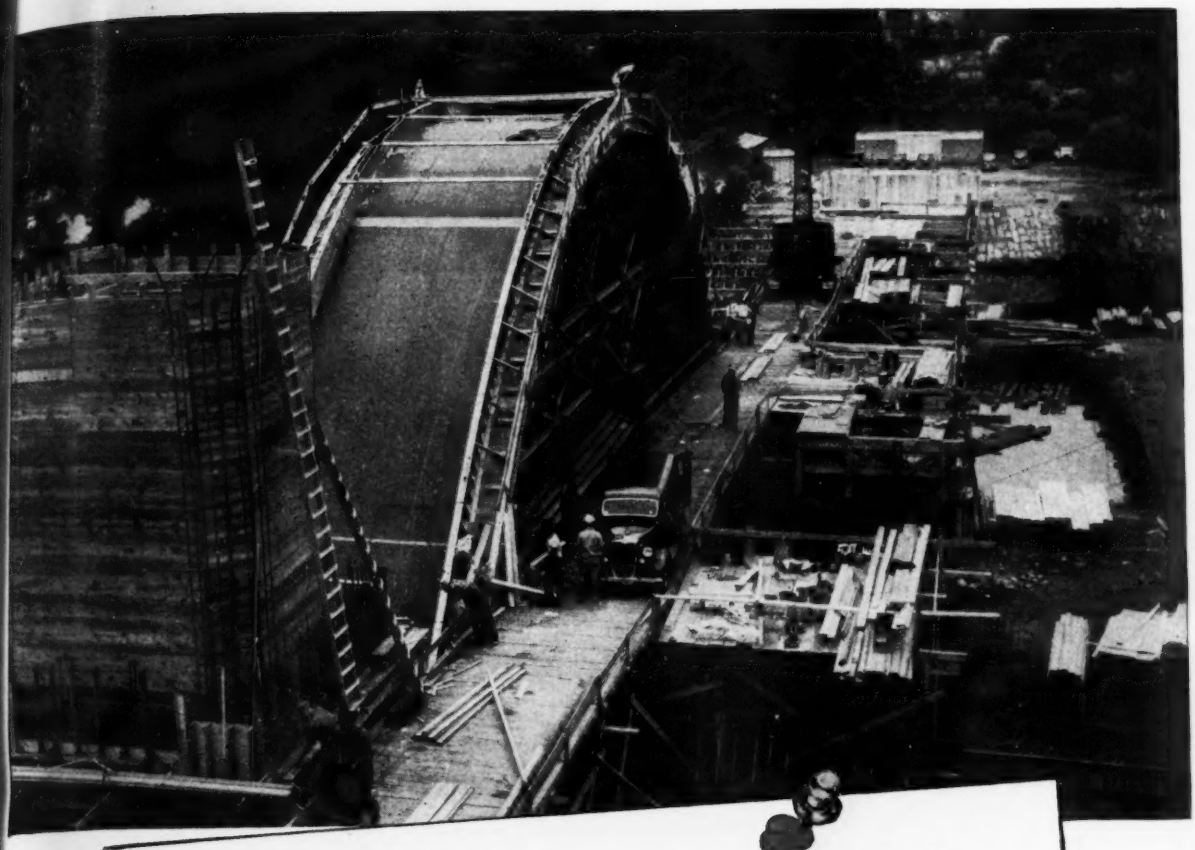
FRED W. CLIMER, director of personnel at the GOODYEAR TIRE & RUBBER Co. since Dec. 1, 1938, will join the War Production Board in Washington to take charge of the WPB staff assigned to joint labor-management committee production drives throughout the United States.

GEORGE A. GOSS, of Waterbury, Conn., vice-president and director of the SCOVILLE MANUFACTURING CO., died at Middlebury recently. He was 61 years old.

The TIMKEN ROLLER BEARING Co.'s freight car time conservation program, in effect during the last eleven months, has released for other use the equivalent of 157 100-car freight trains for 24 hours. Since November, 1941, the company has completely eliminated demurrage of all freight cars bringing materials into or taking material out of their ten plants.

An unusual share-the-car plan has been devised by 24 workers in the Gary, Ind., works of CARNEGIE-ILLINOIS STEEL CORP. The men all have a financial interest in a station wagon which they use on a 24-hour a day schedule to transport them to the plant from their homes. At 8 o'clock each morning a group of men arrive at the plant's parking lot in the wagon. A group leaving the mill drive the car back to Wheatfield, Ind. At 4 p.m., another group of workers arrive at the mill from Wheatfield and the men who began work at 8 a.m. drive the car back.

The OSCOOD COMPANY, of Marion, Ohio, recently was awarded the Army-Navy "E" Award at ceremonies attended by officials and employees.



A speedier job . . . lower maintenance costs with Gulf Lubricants and Fuels in service!

"RIGHT at the start of this job, our equipment was checked over by a Gulf engineer, and the story of our benefits from the quality lubricants and fuels he recommended is written in our operating records," says the contractor on this bridge project.* "We have had no time-wasting mechanical delays, and have obtained efficient low-cost performance from every unit."

Here are the chief reasons why so many leading contractors standardize on Gulf products: Gulf lubricants have a well-deserved reputation for stability and toughness — they stand up and give full protection under varied service conditions. And Gulf fuels give top-notch performance. Result: efficient, trouble-free operation of equipment, long service life, and low costs for maintenance.

Make sure your equipment gets the operating benefits of Gulf's higher quality lubricants and fuels. They are quickly available to you through more than 1200 warehouses located in 30 states from Maine to New Mexico. Write or 'phone your nearest Gulf office today.

*Frank T. Wescott, North Attleboro, Mass., is the general contractor on this 925-ft. span bridge, which is part of the George Washington Highway by-pass at Providence, Rhode Island. Gulf lubricants and fuels have helped prevent delays and costly repairs.

GULF

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GULF REFINING COMPANY
GULF BUILDING · PITTSBURGH, PA.

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Check up on the roughest, toughest track haulage jobs in the country and you'll find Plymouth Locomotives . . . delivering the peak performance essential to all-out operations.

There are mighty good reasons for this: extreme efficiency, payload power, reliable ruggedness, sufficient speed to meet stepped-up schedules.

Get all the facts and figures. They'll help you plan your production.

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NEW PUBLICATIONS

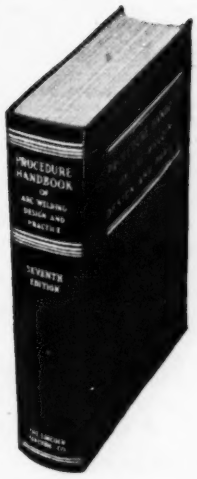
Storage—Presenting data of importance at the present time, a 36-page report on the STORAGE of 1:3 BUTADIENE, prepared by the Pittsburgh-Des Moines Chemical Storage Fellowship, is now available to those who are concerned with the storage of this substance. The report contains new information and data on variables which affect storage costs, recommendations for types of storage containers, cost data, information regarding corrosive effects on container materials, and deterioration of Butadiene during storage. Other sections include physical constants, chemical properties, and methods of preparation as they relate to storage problems. — *Pittsburgh-Des Moines Chemical Storage Fellowship, Mellon Institute of Industrial Research, Pittsburgh, Pa.*

Motor Fitness—Motor fitness requirements is the subject of a new 40-page illustrated bulletin (GED-1017) issued by the General Electric Co. Although primarily intended for plants converted to war production, the bulletin will prove valuable in all plants in which motors are widely used. It discusses the following subjects in a highly comprehensive and informative manner: How to get the most service out of old and new motors, "switching" motors from one job to another, and equipping old machines with new motors. Also included are selection and application of motors, various types of motor inclosures, secondary ratings of standard integral-hp. motors, ways to determine WR^2, motor maintenance, full load currents of motors, and others.—*General Electric Co., Schenectady, N. Y.*

Recorders — In Bulletin A-321, the Foxboro Co. presents its operation—time recorders, both electric-operated and mechanical, and explains the application of such instruments to the processes of various industries. Their importance in test engineering, in setting job standards, and in cost accounting and production control is discussed, and diagrams show typical installations for several different kinds of work. Complete specifications are included, for single- and multiple-pen instruments.—*The Foxboro Co., Foxboro, Mass.*

Rope—Continuing its series of bulletins on the care and maintenance of wire rope, the Macwhyte Co. has issued a new supplement, No. 42-100, of its publication, "Ropeology." The supplement undertakes to explain maintenance problems, such as proper sizes of sheaves, lubrication methods, and other matters. —*The Macwhyte Co., Kenosha, Wis.*

WPB ORDERS WELDING



THE new WPB national emergency specifications for design, fabrication and erection of structural steel for buildings requires the person responsible for a design to certify that the specifications have been complied with, and that "the building has been designed to secure the greatest savings in steel practical through continuity in design and welded fabrication."

Here is structural welding information to guide you in complying with this new ruling:

PART VII

DESIGNING OF
ARC WELDED STRUCTURES

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The New "Procedure Handbook"

Recognized by architects, engineers and fabricators as the authentic reference book on structural welding. Contains 282 pages on all phases of structural design alone—see title page of Structural Chapter reproduced here. Other chapters on welding technique, procedures, speeds, costs, testing methods, application studies and reference data.

Total 1308 pages. 1810 illustrations. Size 6" x 9" x 1¾". Well indexed for quick reference. Price only $1.50, postpaid in U. S.; $2.00 elsewhere. Mail the coupon to Lincoln.

Studies in Structural Arc Welding

Issued periodically. Gives pertinent information on various aspects of structural welded design. Present series on anchor attachments for base plates. Free to engineers and designers. Mail the coupon to Lincoln.

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The Jeep—our Army's mechanical mule, has achieved a reputation of out-climbing, out-pulling and out-maneuvering anything of its weight ever put on four wheels. On every war front in the world, the Jeep is now the pride and joy of Brass Hats and Buck Privates alike.

But remember the men who build the Jeeps—those who train to operate and follow them—and the millions of others who are engaged in our war effort. For all, there had to be an abundance of water. It was the Layne Organization, who in the majority of cases, drilled the wells and built the systems that provide water by the millions of gallons. To a well water system, the name Layne is as famed as is the name Jeep to a four wheel vehicle.

Layne's reputation like that of the Jeep has been won on the field of action. Throughout the entire Nation, Layne wells and pumps are doing a magnificent job —providing water for ordnance plants, munition factories, training camps, air fields, ship yards and all kinds of war material producers. For late bulletins, address.

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Layne-Western Co. of Minn.....Minneapolis, Minn.
International Water Supply, Ltd...London, Ont.

WORLD'S LARGEST WATER DEVELOPERS

MEN AND JOBS

Reinhold B. Hansen, formerly with the Hetch Hetchy Water Supply Project of the city and county of San Francisco, Calif. is now construction engineer with the Maritime Commission at Oakland.

Haskell Mize, right-of-way engineer of Shelby County, Tenn., has resigned that post.

I. L. Johnson, now stationed at Pearl Harbor, Hawaii, as officer in charge of the Public Works Design Section, 14th Naval District, has recently been promoted from the rank of lieutenant to that of lieutenant commander. Commander Johnson was formerly staff engineer for Donald R. Warren, consulting structural and civil engineer of Los Angeles, Calif.

Maj. John S. Wilfley, area engineer at Everett, Wash., for the Corps of Engineers, has been ordered to report for foreign duty. He will be succeeded by **Captain George L. Barkhurst,** who has been executive officer of the area since January.

H. V. Gass, of Knoxville, Tenn., has been made acting superintendent of the Fontana Dam reservoir clearance project for the Tennessee Valley Authority, with headquarters at Bryson City, N. C. He succeeds **R. F. Holly,** who resigned recently.

Millard S. Hayworth, of Asheboro, N. C., has been promoted from first lieutenant to captain in the Corps of Engineers stationed at Morris Field, Charlotte, N. C. as post engineer.

Emil J. Kratt, project manager for the J. A. Jones Construction Co., Charlotte, N. C., has been elected a vice president of the organization.

Robert J. Hassett, formerly an employee of the Iowa Highway Commission, has been named acting city traffic engineer for Des Moines, replacing **E. H. Gunton.**

Lt. Col. Robert N. McLeod, Quebec, Canada, civil engineer, has been given command of an artillery regiment overseas.

Joseph Steinberg, New York City civil engineer, is now an associate engineer for the U. S. Engineers attached to the New York district.

Thomas J. Mitchell, formerly engineer with the Bureau of Tests, County of

BUILT TO HANG ON

BECAUSE they have a special grip, Electroline-Fiege Wire Rope Connectors "hang on" under all conditions. The bite is tapered from rear to front. That dampens vibrations, thus preventing crystallization and fraying, gives you a positive connection and added rope life.

Electroline-Fiege connectors are safe (no molten metals to injure workmen or weaken wire rope,) streamlined, easy to install and economical. There are styles and sizes to fit every need. Write today for the interesting booklet, "Positive Grip". It is full of useful data.

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Compact! Powerful! Safe!

DISTRIBUTABLE CONTROLLED POWER

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SEATTLE, U.S.A.

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Money Has Been Saved on These Jobs

1200' assembled pipe (132 Tons) were lowered to bed of Mississippi at St. Paul with 9—5-Ton Beebes, three lines to each hoist through blocks.
Hudson River Bridge sidewalks were laid in sections with 32—5-Ton Beebes.
Longest wooden trusses in world were installed with ONE 5-Ton Beebe after power hoists proved impractical.

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When raising, lowering, or placing costs by power are a serious problem, the answer is the right number of Beebe Bros. All Steel Hand Hoists MANNED IN UNISON. Available in 2, 5 and 15 Ton sizes. Sold through leading dealers in all trade centers. List of dealers sent upon request.

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★

"THE STRONGEST GEARED POWER FOR ITS WEIGHT IN THE WORLD"

Allegheny, Pittsburgh, Pa., has joined the Carnegie-Illinois Steel Corporation. **Albert E. Cummings,** district manager of the Raymond Concrete Pile Co., and **Ralph B. Peck,** formerly in charge of the soil investigation for the Chicago subway, have been appointed lecturers on the civil engineering staff of the University of Illinois.

B. Everett Beavin, formerly executive and technical director of the Housing Authority of the city of Annapolis, Md., is now project manager for Carr & J. E. Greiner Co., architect-engineers, U. S. Marine Barracks, New River, N. C.

Lt. Col. Lynn C. Barnes, area engineer in charge of the Twin Cities Ordnance plant in Minnesota, recently was promoted from the rank of major.

V. F. Hobbs, bridge designer with the North Carolina state highway and public works commission at Raleigh, has resigned to join the Corps of Engineers.

R. A. Trebilcock, Norway, Mich., city engineer, has resigned to take private work.

Murray Howell, bridge draftsman for the North Carolina state highway and public works commission, has been commissioned second lieutenant in the Corps of Engineers.

B. L. Drane has been named waterworks superintendent for the city of Farriday, La., succeeding **Eugene B. Schuchs,** who recently entered military service.

John Beatty, city planning engineer for Waukesha, Wis., has enlisted for training as a naval reserve officer.

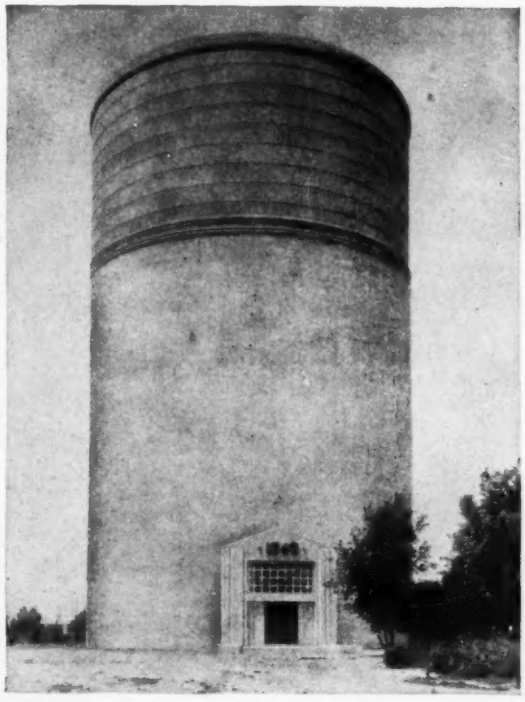
William Van E. Sprinkle, Durham, N. C., architect, has been commissioned a first lieutenant in the Corps of Engineers.

Frank Hayes, Umatilla county, Ore., engineer since 1934, has become city engineer of Pendleton, Ore.

Irwin Brooks Rutledge, formerly assistant engineer of ways and plans, Alabama highway department, has reported to Wilmington, N. C., as a major in the army specialist corps.

Harold Maxwell Sather, of Seattle, Wash., recently appointed as a second lieutenant in the Corps of Engineers, has been assigned as an assistant to the Spokane area engineer.

Samuel Gould, Jr., has been appointed Mahoning County, Ohio, engineer, succeeding **Robert J. Schomer,** now a U. S. Army captain serving overseas.



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PRODUCTS

Required to be leak-proof under great pressure, the bottom of the million-gallon Elevator Water Tower at a fort in the south, was surfaced with a combination of Carey Waterproofing Products.

The tower was developed by MacDonald Engineering Company, Chicago, who are building other towers of the same type.

If you have a water-storage problem where prevention of leakage is difficult, put it up to CAREY for the waterproofing materials that will do the job. A nationwide organization is at your service.

For details address Dept. 30.

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buildings—bridges
trestles—tanks—towers

Here—in this up-to-the-minute manual—are scores of tested helps for all concerned with the planning and building of any type of wood and steel structure. Based on actual experience and successful practice, this material provides engineers, construction men, draftsmen, designers, and others with a ready, accurate means for solving the special as well as the more common problems of their daily jobs.

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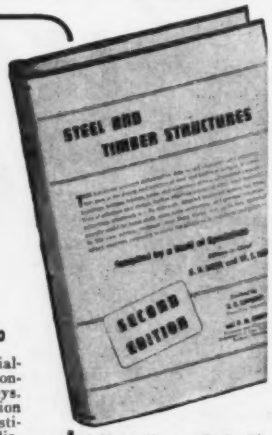
In this authoritative manual, a distinguished staff of specialists present complete information on the design and construction of buildings, bridges, trestles, tanks and chimneys. The book provides specific information on problems of selection and design, factors affecting structural steel, steel erection, estimating steelwork, etc., with explanatory illustrations and diagrams, step-by-step procedure and suggestions, up-to-date practices—everything to aid you in saving time, effort and money at every stage of steel and wood structural work.



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steel mill buildings
timber mill buildings
roof trusses
steel railway bridges
steel highway bridges
timber bridges and trestles
vertical cylindrical tanks
elevated tanks and towers
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structural steel detailing
fabrication of structural steel
steel erection
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MEETINGS

INDUSTRIAL HYGIENE FOUNDATION, 7th annual meeting, Mellon Institute, Pittsburgh, Pa., Nov. 10-11.

HIGHWAY RESEARCH BOARD, 22nd annual meeting, Hotel Statler, St. Louis, Mo., Dec. 2-4.

AMERICAN ASSOCIATION OF STATE HIGHWAY OFFICIALS, annual meeting, Hotel Statler, St. Louis, Mo., Dec. 7-9.

AMERICAN SOCIETY OF CIVIL ENGINEERS, annual meeting, Society headquarters, New York, N. Y., Jan. 20-22, 1943.

REGIONAL AND LOCAL MEETINGS

ENGINEERS' SOCIETY OF WESTERN PENNSYLVANIA, Third Annual Water Conference, Wm. Penn Hotel, Pittsburgh, Pa., Nov. 9-10.

SOUTH DAKOTA COUNTY COMMISSIONERS' ASSOCIATION, annual convention, Pierre, S. D., Nov. 16-18.

NORTHERN CALIFORNIA CHAPTER, ASSOCIATED GENERAL CONTRACTORS OF AMERICA, 24th annual convention, Palace Hotel, San Francisco, Dec. 11-12.

Elections and Activities

THE WISCONSIN SECTION of the American Water Works Association held its 21st annual meeting at Wausau recently. Speakers included Alvin J. Cooper, superintendent of the distribution system for Elgin, Ill.; Arthur Gorman, chief, water production section, War Production Board; W. M. Wallace, superintendent of filtration and sewage treatment, Detroit, Mich.; E. W. DeBerard, resident engineer at Centralia, Ill., on a water project there, and others.

THE KINGS COUNTY Chapter of the New York State Society of Professional Engineers recently opened its fall season at the Brooklyn Engineers Clubhouse.

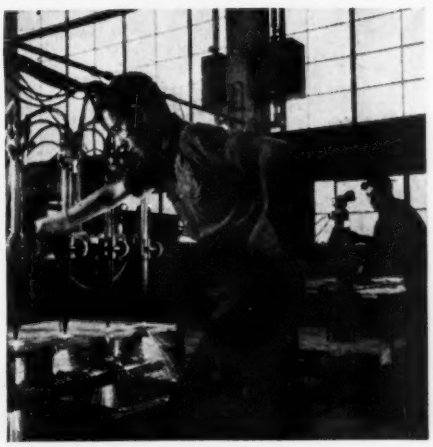
SURVEYORS and engineers from all sections of Arizona met at Phoenix, recently for the fourth annual Arizona land surveyors conference. F. N. Holmquist of Phoenix was chairman during an all-day program.

K. L. HANSEN, of Milwaukee, recently was elected president of the American Welding Society, after an annual meeting held at Cleveland, Ohio. Other officers elected included David Arnott, New

Sunlight floods every part of submarine engine plant

Far out of practical range of enemy bombers, a new Midwestern plant for the construction of submarine diesel engines is now in full operation. Noteworthy in this 300,720-sq. ft. plant is the provision made for daytime workers to work in clear, natural light. Over 60 per cent of the entire outer surface of the building, including the roof, is glass. Abundant sunlight floods the interior, making every department "clear as day," and thus stepping up production efficiency.

Clean, simple interior design heightens the effect of brightness. All piping and wiring are close to columns. All conduits run underground. Crane runways are painted Chinese red; pipes are red and blue. Remainder of interior is painted dead white. The illustration at right shows a multiple flame-cutting operation in the new plant.



Architect and Engineer: W. Fred Dolke
Structural Engineers: Westcott Engineering Co.
Mechanical and Electrical Engineer: Irving S. Brooke
Contractors: Cunningham Bros.

Rails for outside window-washing equipment are provided on every side of the plant. Another feature is a special test-block for the submarine engines, consisting of a platform of steel and concrete, 4 ft. below the floor. The steel rails on top of this platform had to be set dead level in the concrete.

Bethlehem Steel Company supplied the structural shapes, and bolts, nuts and rivets used in constructing this plant. The 4330 tons of structural steel were fabricated and erected by Bethlehem's Fabricated Steel Construction Division.

BETHLEHEM STEEL COMPANY

BETHLEHEM STEEL

. . . . for remote or "on-the-spot" control

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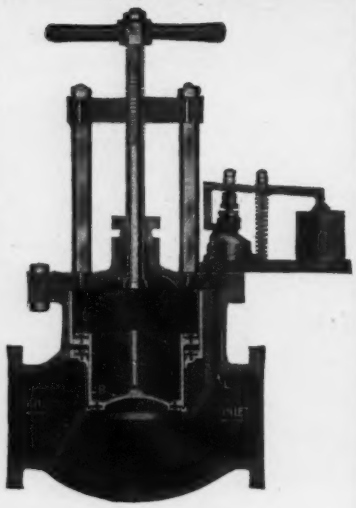

ELECTRIC and MANUAL WATER SERVICE VALVES

Here are valves suitable for either remote electrical control or "on-the-spot" manual service . . . they are arranged to open or close automatically as the solenoid is energized or de-energized. Solenoid comes for AC or DC circuit, for any voltage. Special design of the liner seat, plus perfect air and water cushioning, completely eliminates water hammer or shock. These water service valves are available in sizes from 3" to 36", globe and angle types . . . also in numerous metals and alloys to meet your particular demands. Get the entire story on these valves, as well as all other G-A Valves, in G-A's Catalog No. 26—write for your copy today!

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York, first vice-president; Isaac Harter, Barberton, Ohio, second vice-president.

WALTER R. HAGEDOHN of Los Angeles has been elected president of the State Association of California Architects at that organization's 1942 convention held recently in San Francisco. Other officers include: Norman K. Blanchard, San Francisco; first vice-president; Robert H. Orr, Los Angeles, and Russell G. Delappe, Modesto, second vice president; Harvey P. Clark, San Francisco, secretary.

THE JUNIOR SECTION, Montreal branch, of the Engineering Institute of Canada, recently opened its fall season with an address by J. A. Lalonde, chairman of the Montreal branch.

L. A. JACKSON, general manager of the Little Rock, Ark., municipal waterworks, has been elected chairman of the Southwest Water Works Association. Other officers elected at a three day meeting held recently at Little Rock include: Robert W. Harding, San Antonio, Tex., vice chairman; B. G. Cole, Monroe, La., trustee; Frank S. Taylor, Oklahoma City, Okla., trustee; Homer Hunter, Dallas, Tex., trustee, and M. H. Phillips, Paragould, trustee. The Fuller Award, given each year for outstanding work in the interests of the waterworks industry, was voted to Edmond Smith, of Dallas.

THE ASSOCIATION of Western State Engineers, at the conclusion of its 15th annual convention at Denver, Colo., recently, elected Wardner G. Scott, state engineer of Nebraska, as president, succeeding Alfred Merritt Smith, Nevada state engineer. The organization passed a resolution reaffirming its opposition to the claim of the federal government to any and all unappropriated waters of non-navigable streams in the western states which practice irrigation. It also declared that federal acts relating to water development in the western states should be amended to include provisions requiring that, in the prosecution of all work designed for water conservation, the particular federal agency involved should be required to comply with state laws relating to ownership and administration of the water. A third resolution urged the appropriation by Congress of adequate funds to carry out programs of topographic mapping by the U. S. Geological Survey, and collection of information on surface and ground water.

FOUR nationally known sanitation and public health experts addressed a recent convention of the Arizona Sewage and Water Works Association, held at Phoenix recently. Speakers included Maj. Gerald A. Arnold, regional sanitary

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corps, San Francisco, Cal.; V. B. Lamoureaux, district engineer of the U. S. Public Health Service, Denver, Colo.; Ray Goudey, sanitary engineer, Bureau of Waterworks and Supply, Los Angeles, Cal., and Charles G. Gillespie, chief of the sanitation division, California state department of health.

More than 500 delegates from the 17 western reclamation states, representing water users on 20 million acres of land, met at Denver, Colo., recently, for the 11th annual convention of the National Reclamation Association. Resolutions passed included one favoring an amendment of the sugar act to permit progressive expansion of the industry until the nation produces not less than 50 percent of its needed sugar; condemned proposed regional water authorities as impairing existing laws and rights; urged passage of uniform water codes by all states, and other measures. Speakers included Abe Fortas, Undersecretary of the Interior; John C. Page, commissioner of the Bureau of Reclamation; J. W. Haw, of the Northern Pacific Railroad Co., and others.

John J. Quinn, Knoxville, was elected chairman of the Kentucky-Tennessee section, American Water Works Association, at a recent convention at Paducah, Ky. Other officers elected were: Clark J. Cramer, Lexington, Ky., trustee; B. E. Payne, Louisville, Ky., trustee; G. R. Kavanaugh, Knoxville, Tenn., trustee; Howard D. Schmidt, Nashville, Tenn., secretary-treasurer.

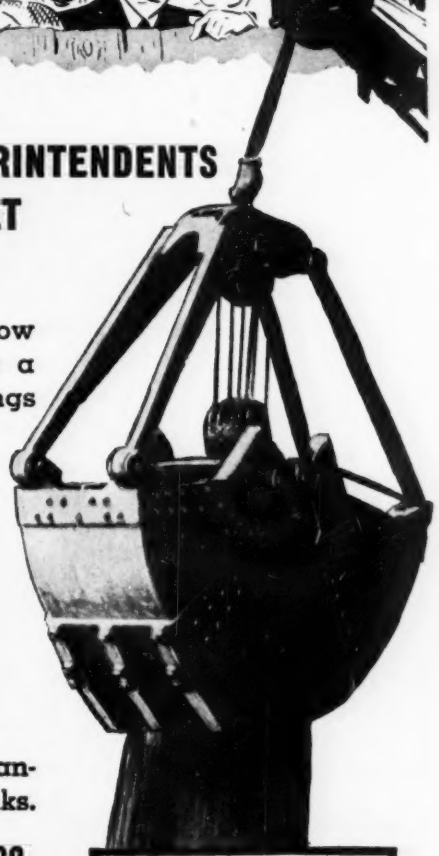
W. H. Weaver, superintendent of waterworks for Decatur and DeKalb county, Georgia, recently was elected president of the Georgia Water and Sewage Association.

S. S. Steinberg, dean of the college of engineering at the University of Maryland, recently was named chairman of the new National Capital section of the Society for the Promotion of Engineering Education. Other officers are: A. G. Christie, Johns Hopkins University, vice chairman; E. J. Stocking, assistant chief of the examining board, U. S. Civil Service Committee, secretary-treasurer.

The Wisconsin League of Municipalities elected the following officers at the close of its 1942 convention at Oshkosh recently: Henry Traxler, Janesville, president; C. L. Peters, Luxemburg, vice-president; and Fred H. MacMillin, Madison, secretary.

The Engineers' Society of Western Pennsylvania will hold its third annual water conference Nov. 9 and 10 at the Hotel William Penn, Pittsburgh. H. M. Olson will be general conference chairman for the sessions.

EVEN SIDEWALK SUPERINTENDENTS KNOW A GOOD BUCKET WHEN THEY SEE IT



Of course they judge on how quickly it buries itself for a big pay load, how it swings without spilling, to dump smoothly and cleanly into the waiting truck. They don't know, as the contractor's superintendent does know, how long Williams Buckets last with little maintenance expense, and how well they deliver on the toughest hardpan jobs or handle rubble or concrete chunks.

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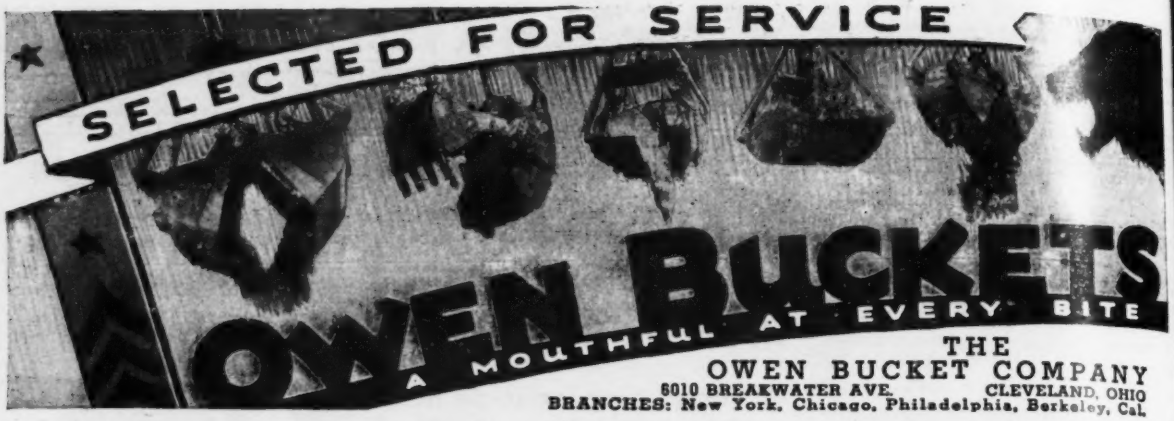

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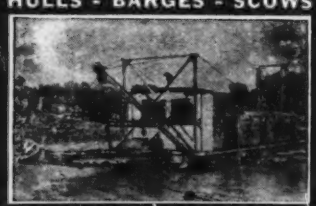

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Fort Wayne, Ind.
Write for Bulletin RD-102

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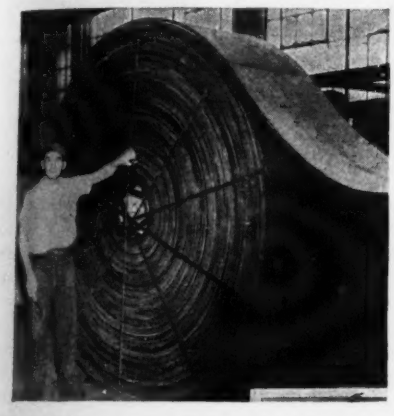
(*Continued from p. 130*)

Gummed Labels

Developed after considerable laboratory experimentation, the special Stick-to-Metal Gumming is now available from the Ever Ready Label Corp. for labeling tools, products and machines. Stickers that carry inspection data, instructions, warnings, etc., as well as plain gummed labels are available on either paper or linen fabric. — *The Ever Ready Label Corp., 141 E. 25th St., New York, N. Y.*

Conveyor Belts

A new type of conveyor belt using steel cables in place of the customary cords or fabric has been announced by the Goodyear Tire & Rubber Co. Engineers said that one of the steel-carcass conveyor belts is already in use at a mine in Duluth, Minn., where it is used to lift ore 240 ft. in a 1,100-ft. conveyor. The belt completes the lifting task in one continuous operation, obviating the one, two or three transfers from individual belts which would have been necessary with

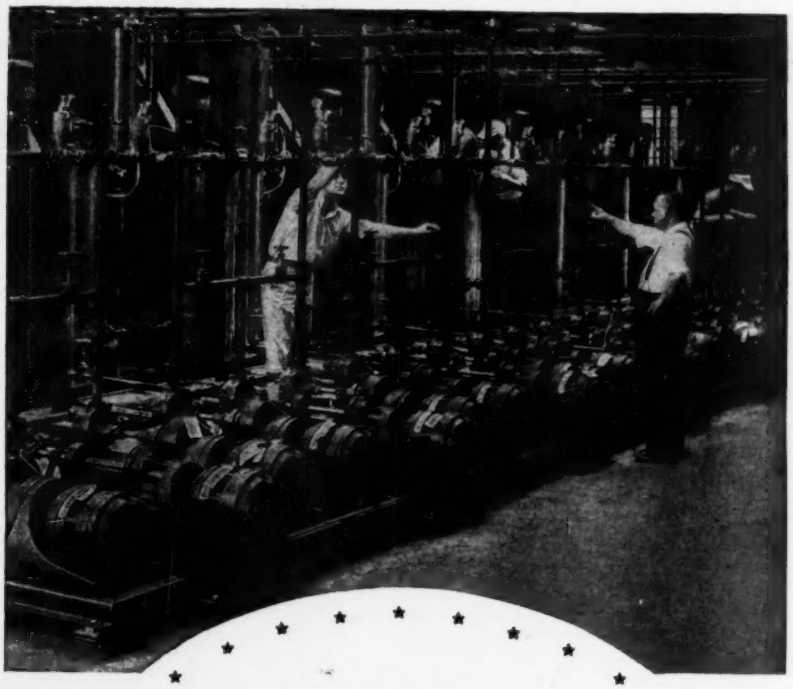


the old type of conventional cotton fabric or cotton cord construction. Although no thicker than the conveyor belt with six plies of fabric, the new belt's strength is actually the equivalent of 14 such plies. Engineers assert that the steel cables in conveyor belts permit a maximum of troughing. This means a deeper depression or valley in the center of the belt, without injury to the belt itself, in order that heavier loads can be carried without spilling over the sides. The carcass of each steel-cable belt consists of parallel steel cables, each cable containing a multiplicity of closely-laid thin strands. In the mine belt mentioned there are 1,341,000 ft. of cables. — *The Goodyear Tire & Rubber Co., Akron, Ohio.*

Welding Transformers

A new line of heavy duty alternating current welding transformers, especially

These 36 F-M motor-driven rotary pumps in a large manufacturer's paint mixing room serve distant paint spray booths.



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That's More Than Skin Deep!

THOSE pumps you are about to buy for war production—will they serve you efficiently not only now but also through the years to come?

They will if you choose Fairbanks-Morse Pumps. For these pumps have mechanical superiority which permits them to retain their efficiency long after less highly engineered pumps begin to waste power.

So use your priority to buy pumps for today with an eye for tomorrow. Fairbanks, Morse & Co., 600 S. Michigan Ave., Chicago, Illinois.

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FOR structural timber, flooring, roofs—wherever lumber may encounter severe service conditions—architects and engineers are specifying "CZC" treated lumber.

Du Pont "CZC" gives lumber qualities of durability which make it a distinctive structural material. Chromated Zinc Chloride provides durable protection against decay, and repels termites, thereby extending the expected service life 3 to 10 times. At the same time it gives measurable fire resistance and leaves the wood clean, odorless, paintable and easily fabricated.

ECONOMY

"CZC" treatment permits the use of less naturally durable woods which become more lasting than the better grades untreated. In addition "CZC" treatment reduces the need for overscaling to allow for depreciation in strength due to decay. Properly treated lumber suffers no loss of strength in pressure treatment. The same values for load and stress calculations are applied as designated for untreated wood.

In addition many builders are taking advantage of "CZC" fire retardant properties by specifying pressure treatment to provide fire resistant structural timbers. Write for full information.

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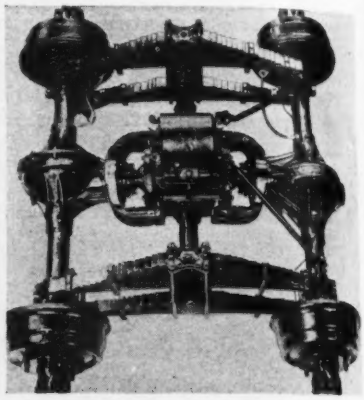
BETTER THINGS FOR BETTER LIVING . . . THROUGH CHEMISTRY

designed for Unionmelt welding has been announced by the General Electric Co. The welders are available in 750- and 1000-ampere sizes, (NEMA) for 220-, 440- and 550-volt power. Features of the line are built-in capacitors and built-in primary control.—*General Electric Company, Schenectady, N. Y.*

Truck Drives

The Thornton Tandem Co., manufacturers of the Thornton-four-rear-wheel drive for motor trucks, has announced that it has started to make deliveries on units for a construction company working on the Alaska Highway. The drive converts 1½- to 3-ton trucks to durable, flexible, heavy-duty units. Of particular

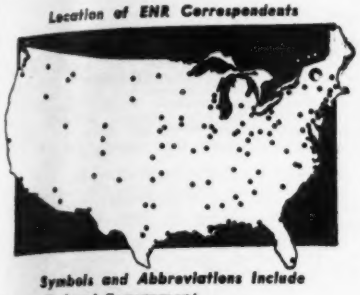


importance is the fact that tractive effort or rim-pull is doubled through gear reduction. An added advantage is the walking-beam type dual spring suspension which provides important advantages such as improved road contact. The inter-axle, two-speed transmission multiples the power for hard-pull and furnishes speed to meet fast schedules over the highway. Wide range of forward and reverse speeds gives the proper ratio for any hauling condition.—*The Thornton Tandem Co., Detroit, Mich.*

CONSTRUCTION REPORTS

Compiled by Business News Department—Engineering News-Record, 330 W. 42nd St., New York
ELSIE EAVES, Manager *SCOTT McLEOD, Statistician*
(Daily service also available—Write for details)

Location of ENR Correspondents



Symbols and Abbreviations Include

† Federal Government
★ Project of $500,000 or over
ENR Engineering News-Record
CD Engineering News-Record Construction Daily
A-E-M Architect — Engineer-Management type of contract.

Projects—By Size

Construction projects here reported cover the United States and Canada, are of these minimum sizes or larger; water supply, earthwork, waterworks, $15,000; other public works, $25,000; industrial buildings, $40,000; other buildings, $150,000.

Classes of Construction

(Named in order of Listing)

Water Supply	Unclassified
Sewers, Waste Disposal	Latin America
Bridges, Grade Cross'gs	Public Buildings
Streets & Roads	Commercial Buildings
Earthwork, Waterways	Industrial Buildings

Stages Reported

PROPOSED: (except Streets & Roads):
BIDS ASKED (new announcements only. For full calendar, see also preceding issues of ENR):
LOW BIDDERS: On jobs below $500,000 value all low bidder news will be the final reports published on the projects involved except where award is not made to the low bidder. In this case, a supplementary contract award report will be published.
CONTRACTS AWARDED: Except awards to low bidders previously reported in low bidder stage.

Dates shown are of issue in which last previous report was published.

Note: To comply with censorship requirements, addresses on some reports are being generalized. Data which would reveal the purpose of the improvements and the size are withheld. The name of contractor and general area are reported.

WATER SUPPLY

PROPOSED WORK

†Texas—U. S. Eng., 25 St. and Avenue F, Galveston, bids soon exten. water, sanitary sewer, and natural gas sys. $80,000. Plans deposit $25.

★**†Tex., Houston**—City, J. G. Turney, dir. P. Wks., WW imprvs. Tex. 41-564. $2,100,000. **FWA.** Garrett Eng. Co., 3504 Audubon St., engrs. CD 8/13—ENR 8/20.

★**†Tex., Houston**—San Jacinto River Conservation & Reclamation Dist., c/o R. V. Bouldin, bids soon, WW exten., concrete and earthen dam on San Jacinto River, 25 mi. north of here, etc., $2,100,000. Total cost $5,750,000. **FWA.** Haile & McClendon, 2801 San Jacinto St., Houston, and Freese & Nichols, Capps Bldg., Fort Worth, engrs. CD 7/21—ENR 7/23.

BIDS ASKED

Bids Asked About November 6

†Texas—U. S. Eng., Fort Sam Houston, pump. sta., surface water tank, Spec. 42-385, Bell Co. Over $15,000. Plans deposit $25.

Bids Asked November 10

Mich., Redford (sta. Detroit)—Redford Twp. Bd., 15145 Beech Rd., Redford Twp., c.i. water mains Denby and Indian Aves. Plans deposit $10. L. Smith, Detroit, Wayne Co., engr.

Bids Asked November 12

†Tenn., Milan—City, 500,000 gal. concrete ground level reservoir, gravity sect. type, c.i. pipe connections to existing reservoir, Div. D, Docket Tenn 4-112. **FWA.** W. L. Picton, 711 American Bank Bldg., Nashville, civil engr. CD 10/8/41—ENR 10/16/41.

Bids Asked November 18

†N. C., New Bern—City, WW addn. $293,000. **FWA.** Peirson & Whitman, Security Bank Bldg., Raleigh, consult. engrs.

Bids Asked

†Texas—Pub. Housing Auth., NHA, Electric Bldg., 7 and Taylor Sts., Fort Worth, water distr. lines, facilities, natural gas facilities, sanitary sewer collection lines $275,000; outside electrical distr. sys. over $25,000.

LOW BIDDERS

†N. Y., Schenectady—City, at office Contract & Supply Com., City Hall, Jay St., Oct. 28, general construction, WW from Stock Constr. Corp., Grand Central Terminal, New York $208,928*** electrical work, from M. Gold & Son, 619 State St., $79,500 plumbing and heating, from Thomas C. Brown Co., $6,449. **FWA.** CD 10/13—ENR 10/15.

CONTRACTS AWARDED

†Conn., East Hartford (br. Hartford)—Federal Works Agency, 2 Lafayette St., New York, N. Y., watermains, to F. B. O'Neil & Co., 22 Preston St., Hartford, $19,760.

†Me., Portland—Portland Water Dist., land watermains, appurtenances, to Wyman & Simpson, Inc., 283 Water St., Augusta, $68,310. **FWA.** CD 9/23—ENR 10/1 under CA.

★**†Michigan**—U. S. Eng., 700 Union Guardian Bldg., Detroit, water and sewer mains, Washtenaw Co., to R. D. Baker, 19200 W. 8 Mile Rd., Detroit, less than $1,000,000; chain link fence, to American Steel & Wire Co., Cyclone Fence Div., 1130 W. Grand Blvd., Detroit, less than $1,000,000.

†Tennessee—U. S. Eng., P. O. Box 97, Memphis, water pumping, storage and treatment plant, Dyer Co., to W. L. Sharpe Contg. Co., Col. Mutual Trust Bldg., Memphis, under $50,000.

†Texas—U. S. Eng., 231 W. Main St., Denison, water lines, facilities, sanitary sewer collection lines, natural gas distr. sys., to B. B. Adams, 414 1st Natl. Bank Bldg., Fort Worth, $50,000-$100,000.

†Texas—U. S. Eng., Fort Sam Houston, addnl. water distr. lines, Bexar Co., to Engineering Contractors, 508 Fredericksburg Rd., San Antonio, under $50,000.

SEWERS, WASTE DISPOSAL

PROPOSED WORK

Kan., Wichita—Imprv. sewage disposal plant. $236,000. Applied for FWA funds. CD 7/15/41—ENR 7/17/41.

Wis., La Crosse—J. H. Barth, city engr., 42 in. sewer Avon St., increasing to 45 in. at Black River $28,000.

Ont., Newton—Mornington Twp., Newton, drainage imprvs. R. W. Code, Victor Bldg., London, engr.

BIDS ASKED

Bids Asked November 10

Md., Rockville—Comrs. Montgomery Co., Rockville, storm sewer, Silver Springs. W. W. Payne, New County Bldg., Silver Springs, engr.

†Tex., Houston—City, J. G. Turney, P. Wks. Dir., Golfcrest and Lum Terrace sanitary sewer collection sys. $231,800. **FWA.**

Bids Asked November 16

†N. Y., Cheektowaga—Town Bd., A. Sturm, clk., Town Hall, addns., imprvs. sewerage sys., N.Y. 30-137. **FWA.** Nussbaumer & Clarke, 327 Franklin St., Buffalo, consult. engrs.; adv. ENR 11/5. CD 4/10—ENR 4/16.

Bids Asked

†California—H. J. Kaiser Co., Latham Sq. Bldg., Oakland, c/o M. N. Wortman, 11 and Cutting Blvd., Richmond, sewers for housing units. $90,000. Federally financed.

†Texas—Pub. Housing Auth., NHA, 1309 Electric Bldg., Fort Worth, sanitary sewers, water lines, natural gas, etc., for housing, Project Tex. 41142. Over $25,000. Plans deposit $25. Wittenberg & Deloney, 807 Pyramid Bldg., Little Rock, Ark., engrs.

LOW BIDDERS

Mo., Kansas City—A. Everham, dir. P. Wks., sanitary sewer, from General Contg. Co., Inc., Benton and Hy. 50, $189,741. R. McKinley, City Hall, engr.

†Ore., Hermiston—City, Oct. 24, sewage disposal plant from B. H. Sheldon, Corvallis, $35,000. **FWA.** CD 1014.

CONTRACTS AWARDED

Conn., Hartford—City, Metropolitan Dist. P. Wks. Bureau, 650 Main St., 345 ft. 15 in. tile and 447 ft. 33 in. rein.-con. sanitary sewer Asylum St., Flood Contr. 5, to B M Y Constr. Co., 752 Silas Deane Pkway., Wethersfield, $32,044. Est. $25,000.

†Georgia—U. S. Eng., U. S. Courthouse & Customhouse, Mobile, Ala., outfall sewer, Muscogee Co., to T. H. Pearce, Brookhaven Rd., Columbus.

★**†Miss., Pascagoula**—City, c/o Mayor and Councilmen, extens., imprvs. sanitary sewerage sys., to Brice Building Co., 215 S. 15 St., Birmingham, Ala., $108,712***to B. L. Knost, Pass Christian, $145,800***and to J. B. McCrary Co., 22 Marietta St. Bl., Atlanta, Ga., $398,942. Grand total $653,454. **FWA.** Bids 10/19, awarded 10/20. CD 10/6—ENR 10/8.

N. J., Newark—Sheeting, storm sewer extens., **WPA. $60,000.** C. Malstrom, Orange and N. 6 Sts., Newark, WPA engr.

Tex., Vernon—J. Y. Owens, mayor, storm sewers. **WPA. $17,300.** F. R. Cromwell, Vernon, engr.

Que., St. Eugene—Dpt. National Defense for Air, Ottawa, Ont., exten. sewers and water lines, No. 13 E. F. T. School, to Bertrand & Frere, Hawkesbury, $35,000.

BRIDGES, GRADE CROSSINGS

PROPOSED WORK

Iowa—State Hy. Comn., Ames, rejected bids Oct. 20, culvert exten., bridge, Lee and Van Buren Counties. CD 10/9.

Pennsylvania—State Hy. Dpt., J. L. Hughes, secy., Harrisburg, abolition grade crossing, and substitution 12 span, 754 ft. rein.-con. bridge over Pennsylvania R.R. tracks and Codorus Creek, Route 66041, York Co. $416,500. T. C. Frame, ch. engr.

BIDS ASKED

Bids Asked November 13

Tex., Houston — Comrs. Harris Co., c/o Judge, Houston, driving, piling and capping and substructure for vehicle bridge, Treaschwig Rd. Over $25,000.

LOW BIDDERS

Alabama—State Hy. Dpt., W. G. Pruett, dir., Montgomery, Oct. 23, Proposal B bridges, Calhoun Co., from N. H. Donahoo, 517 N. 22 St., Birmingham, $40,129; bridges, Coffee and Dale Counties, from W. J. Tidewell Contr. Co., Douglasville, Ga. $103,360. CD 10/16.

Michigan—State Hy. Dpt., Lansing, Oct. 21, MB1 of 66-10-20C-1, Rockland-Victoria Rd., Ontonagon Co., from J. K. Jackson, R.R. 1, Ironwood, $25,731.

CONTRACTS AWARDED

Ohio—State Hy. Dpt., Columbus, bridge, Licking Co., to Baker & Hickey, 85 E. Gay St., Columbus, $35,190. Est. $36,290. Bids 10/20. CD 10/13—ENR 10/15.

STREETS AND ROADS

BIDS ASKED

Bids Asked November 10

Ohio—State Hy. Dpt., Columbus, bituminous surface on waterbound macadam treating Sect. F, SH 407, Coshocton Co., $62,500; grading, draining, concrete paving, bituminous surface treating 3.75 mi. Sects. A, B and Gettysburg of SH 208, U.S. 36, Darke Co., $179,400; asphaltic concrete resurfacing 2.067 mi. Sects. Bay Ridge and B of SH 569, Erie and Ottawa Counties, $24,500; 1.074 mi. Sects. N and H, SH 97, U.S. 224, Medina Co., $13,250; 0.472 mi. Sect. Akron SH 71, Summit Co., $6,220; grading, concrete and salvaged brick paving, roadside imprv. 0.567 mi. Sects. H and I, SH 63, Montgomery Co., $25,600; grading, draining, waterbound macadam widening, asphaltic concrete resurfacing 2.114 mi. Sect. A, SH 153, Trumbull Co., $115,300.

Bids Asked November 24

La., Abbeville—Vermillion Parish Police Jury, gravel road, hy. bridges. $50,000.

Bids Asked

Iowa—State Hy. Comn., Ames, rejected bids

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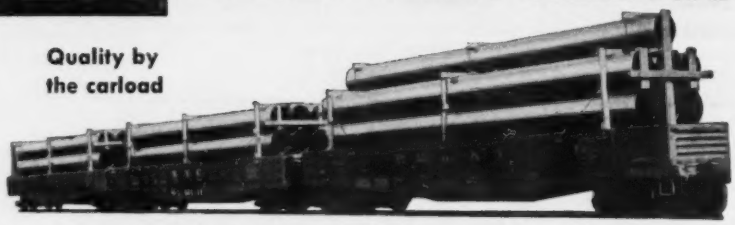

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STREETS AND ROADS (Bids Asked, Cont'd)

Oct. 20, grading roads, Lee [illegible] VanBuren Counties; maintenance resurfacing roads, Monona and Dallas Counties. CD 10/22 under LB.

†**Massachusetts**—U. S. Eng., Post Office Square Bldg., Boston (selected list of bidders), constructing roads, No. 175-43-NE[illegible]21, Middlesex Co. Over $25,000.

North Carolina—State Hy. & P. Wks. Comm., Raleigh, rejected bids Oct. 21, [illegible] 2.33 mi., Camden Co. $300,000-$400,000. New bids soon. CD 10/23—ENR 10/29, under LB.

LOW BIDDERS

★**Alabama**—State Hy. Dpt., Montgomery, Oct. 23, imprv. 2.908 mi., Gilbert Co., from Foster & Creighton Co., Amer. Natl. Bank Bldg., Nashville, **$174,800*****7.868 mi., Coffee and Dale Counties, and 0.[illegible] mi., Calhoun Co., from Mitchell Bros. Constr. Co., 3828 1 Ave. S., Birmingham, **$[illegible],097** and **$58,204** respectively***0.3 mi., Dale Co., from Southeastern Constr. Co., Ozark, **$24,274.** CD 10/16.

Arizona—State Hy. Dpt., Phoenix, Oct. 21, grading, draining, gravel surfacing road, parking area, etc. F.S. 1-AFE 9873, from N. G. Hill & Co., Route 6, Box 551, Phoenix, **$263,291.**

California—State Hy. Dpt., Sacramento, Oct. 28, grading, plant mix surfacing 2.6 mi. Washington St. and Fresno Ave. between San Joaquin River and Route 75, San Joaquin Co., from A. Teichert & Son, Inc., Box 1113, Sacramento, **$120,142.** C. H. Purcell, state hy. engr.

Connecticut—W. J. Cox, comr. State Hy. Dpt., Hartford, Oct. 28, imprv. 1.925 ft. Hartford, from Charter Oak Constr. Co., Inc., 525 Main St., Hartford, **$33,403*****gravel Groton, from Associated Constr. Co., 125 Thames St., Groton, **$32,373*****14,026 ft. Southbury, from T. J. Connor General Contg. Co., 441 Arctic St., Bridgeport, **$53,891.** Received no bids Oct. 28, navigation lights and conduits Hartford-East Hartford. CD 10/23.

D. C., Wash. — District Comrs., District Bldg., Oct. 28, imprv. roadways, Suitland Rd. S.E., from Wilmoth Paving Co., 1 and T Sts. S.W., **$31,452.** Est. $40,000. CD 10/26—ENR 10/22.

Michigan—State Hy. Dpt., Lansing, Oct. 21, grading, drainage structure, concrete paving 0.421 mi. road, DA-Ni-11-59C-1, Berrien Co., from J. G. Yerington, Territorial Rd., R.F.D. 2, Benton Harbor. **$46,581.**

CONTRACTS AWARDED

Arkansas — State Hy. Dpt., Little Rock, imprv. 7.165 mi. Hempstead Co., to W. W. Keeton, Eudora, **$139,552.** Bids 10/22. Rejected bids Oct. 22, paving 6.978 mi. Sebastian Co., 1.506 mi. Jefferson Co. CD 10/15.

†**California**—U. S. Eng., 74 New Montgomery St., San Francisco, addnl. roads, Solano Co., to C. M. Syar, 710 Franklin Ave., Yuba City. Awarded 10/26.

D. C., Wash.—District Comrs., District Bldg., 23,000 sq. yd. concrete alleys, to W. F. Brenizer Co., 1504 S. Capital St., **$60,742.** CD 10/26—ENR 10/28.

Ky., Louisville—Bd. P. Wks., asphalt paving ½ mi. 44 St. from Duncan to Bank Sts., to Louisville Asphalt Co., 240 E. Lee St., **$26,234.** Awarded 10/23.

★**Michigan**—State Hy. Dpt., Lansing, imprv. 2.602 mi. Washtenaw Co., to Bridgeport Core Sand Co., 125 Davenport St., Saginaw, **$557,579.** Bids 10/15. CD 10/22—ENR 10/29, under LB.

N. J., Perth Amboy — Sidewalks, drives, recreational areas. **WPA, $55,000.** J. H. Weitzen, Chestnut and Hamilton Aves., Trenton, WPA engr.

N. J., Trenton—Mercer Co., removing car tracks, repaving streets. **WPA, $55,000.** J. H. Weitzen, Chestnut and Hamilton Aves., WPA engr.

★**Ohio**—State Hy. Dpt., Columbus, imprv. 2.083 mi. Portage and Mahoning Counties, to Hinman Bros. Constr. Co., 314 Investment Bldg., Pittsburgh, Pa., **$641,418,** est. $714,000 ***3.727 mi. Hocking Co. to The Brewer Co., 405 Hazen Bldg., Cincinnati, **$72,110,** est. $72,160***0.93 mi. Portage Co., to D. D. Mullett, 3424 Liberty Ave., Pittsburgh, Pa., **$319,858,** est. $328,200. Grand total $1,033,386. Received no bids imprv. roads, Lorain, Columbiana and Cuyahoga Counties. CD 10/13—ENR 10/15.

†**Oklahoma**—U. S. Eng., 416 Wright Bldg., Tulsa, Contr. 1, grading, shaping streets, roads, Woodward Co., to Apple, White & Russell, 900 N.W. 40 St., Oklahoma City. **$100,000-$500,000.** Bids 10/22.

Pa., Pittsburgh — Comrs. Allegheny Co., imprv. Bower Hill Rd., to Ben Constr. Co., 101 Hargrove St., **$28,975;** Hawkins Ave., to McCrady Constr. Co., 239 4 Ave., **$79,167.** Bids 10/20. CD 10/1—ENR 10/8.

†**Texas**—U. S. Eng., 25 St. and Avenue F, Galveston, roads, streets, military housing, railroad grading, Brazos Co., to Globe Constr. Co., Houston. **$100,000-$500,000.**

N. B., Moncton—Dpt. Natl. Defense for Air, Ottawa, Ont., paving at S.F.T. School 8 and Equip. Depot 5, to Wheaton Bros., Ltd., Downing St., **$25,000.**

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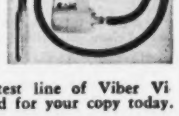

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EARTHWORKS, etc. (Proposed Work)

EARTHWORK, WATERWAYS

PROPOSED WORK

★†**Louisiana**—U. S. Eng., foot of Prytania St., New Orleans, canal from Industrial Canal, east of New Orleans to Rigolets. **$3,000,000.**

La., Franklin—Humble Oil & Refining Co., Canal Bldg., New Orleans, dredging canal.

La., Golden Meadow—Atlantic Refining Co., Magnolia Bldg., Dallas, Tex., dredging.

Wis., Madison—Dane Co., imprv. lakes to prevent pollution. $30,000 appropriated for survey, etc.

BIDS ASKED

Bids Asked November 6

La., Bossier (br. Shreveport)—Bd. Comrs. Bossier Levee Dist., City Hall Bldg., removing 30,000 cu. yd. dirt, concrete outlet, etc., Clear Lake Drainage Project.

LOW BIDDERS

N. Y., New York—Comr. Parks at Office Dpt. Parks, Arsenal Bldg., 64 St. and 5 Ave., Central Park, Oct. 27, reconstructing seawall, incidental work along south and west shore Randall's Island. Contr. M-104-142, from Nicholas Di Menna & Sons, 1525 Blondell Ave., **$22,330.** CD 10/9—ENR 10/22.

†**Tex., Robstown**—At office Nueces Co. Judge, Oct. 19, drainage imprvs., Tex. 41-357, for Nueces Co. D. D. 2, A. M. Stone, Route 1, dir., from McGinnis Bros., 5619 Griggs Rd., Houston, **$485,374.** CD 917—ENR 9/24.

CONTRACTS AWARDED

†**Oregon**—U. S. Eng., Pittock Blk., Portland, stone dike, Multnoman Co., to Eldon & Dennis, 3651 N.E. Wasco St., Portland, under **$50,000.** Awarded 10/26.

Tex., Graham—Upper West Fork Soil Conservation Dist., c/o A. C. Barnett, Decatur, grading, terracing, revetment, retaining walls, etc. for soil conservation project, **WPA. $92,299.**

UNCLASSIFIED

PROPOSED WORK

★†**Illinois, Indiana, Ohio** and **Pennsylvania**—PIPELINE—War Emergencies Pipeline, Inc., B. E. Hull, vice pres., Little Rock, Ark. (Cities Service Oil Co., Atlantic Refining Co., Consolidated Oil Corp., Sun Oil Co., Socony-Vacuum Inc., Tidewater Associated Oil Co., Texas Co., Gulf Refining Co., Shell Oil Co., Pan American Petroleum & Transport Co., and Standard Oil Co. of N. J.), 857 mi. 24 in. pipeline from Norris City, Ill., to Phoenixville, Pa. $60,000,000. Defense Plant Corp. will finance. CD 7/21—ENR 7/23 under CA, Texas and Illinois.

Louisiana—OIL TEST WELL—Thibadoux Heirs c/o Grubbs & Hawkins, South Standard Bldg., Houston, Tex., bids soon drilling, casing, developing 10,000 ft. oil test well. $80,000.

La., Scotland—PIPELINES—Shell Oil Pipe Line Corp., Shell Bldg., Houston, Tex., two 10 in. pipelines, East Baton Rouge Parish.

Missouri—SIGNAL SYSTEM—Missouri Pacific R.R., F. E. Bates, ch. engr., Missouri Pacific Bldg., St. Louis, automatic block signal sys., 95 mi. section Boonville to Eton. $292,000.

N. H., Concord—IMPROVEMENTS—State Airport Comn., Concord, bids soon (from New Hampshire contractors only) imprvs. Foster & Bamford, Inc., 18 N. Main St., engrs. CD 10/21—ENR 10/29.

†**N. J., Lakehurst**—RADIO STATION—Civil Aeronautics Admin., La Guardia Field, Jackson Heights, N. Y., radio station.

★**North Carolina**—RURAL ELECTRIC LINES—Jones-Onslow Electric Membership Corp., Jacksonville, addnl. lines, $735,000 REA allot.

O., Steubenville—TIPPLE—Steubenville Coal & Mining Co., Steubenville, rebuilding tipple, high-shaft mine. $40,000.

†**Texas**—FIRE ALARM SYSTEM, etc.—U. S. Eng., 231 W. Main St., Denison, bids soon, fire alarm and electric watch report sys., Bowie Co. Over $25,000. Plans deposit $50.

Tex, George West—OIL WELL—Continental Oil Co., 1221 Navarro St., San Antonio, drilling, casing, developing 10,500 ft. deep wildcat test oil well. (Jas. L. Vaughan survey No. 577 A-467). $70,000.

BIDS ASKED

†**Va., Gravelly Point**—SEEDING, etc.—Pub. Bldgs. Admin., North Interior Bldg., Wash., D. C., seeding, planting, etc., at Temporary Federal Office Bldg. CD 9/28.

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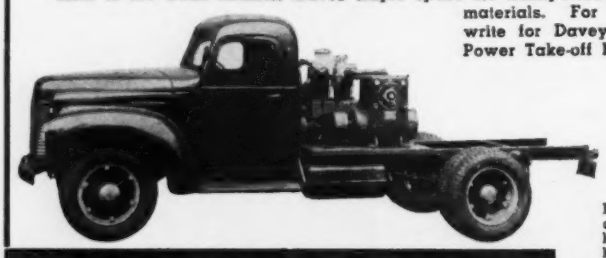

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UNCLASSIFIED (Bids Asked [illegible])

Bids Asked November [illegible]

†**Maine** — IMPROVEMENTS [illegible] U. S. Eng. Park Sq. Bldg., Boston, Mass. [illegible] 175-43-Neg.-130. Aroostook Co.

Bids Asked

†**Texas**—CONSTRUCTION, [illegible] U. S. Eng. 25 St. and Avenue F, Galveston [illegible] electrical distr. sys, water line [illegible] line and gas line extens., bldg. [illegible] Co. $75,000. Plans deposit $5[illegible]

Tex., Yantis—OIL WELL—[illegible] Petroleum Co., Marshall, drilling, [illegible] ing 10,000 ft. wildcat test oil well, on [illegible] acre tract, on Esparcia Survey [illegible]

Tex., Grapeland — OIL WELL[illegible] Adams, Crockett, drilling, [illegible] wells, near here.

Tex., Houston—IMPROVEMENTS—[illegible] Wks., imprvs. $100,000. M. [illegible] Gray St., engr. CD 10/20—ENR 10/29.

Tex., Houston—OIL WELL—[illegible] Airline Link Rd., 6,900 ft. deep [illegible] drilling, casing, developing, etc., near here. $75,000.

Tex., Ozona—OIL WELL—A. J. Rife, [illegible] Rife Constr. Co., 2808 Inwood St., Dallas, drilling, casing, developing, deep [illegible] here. $50,000.

LOW BIDDERS

★†**N. J., Atlantic City**—IMPROVEMENTS—Civil Aeronautics Admin., La Guardia Field, Jackson Heights, N. Y., Oct. 24, imprvs., from Union Paving Co., 1227 N. Broad St., Phila., Pa. **$766,496.** CD 10/19—ENR 10/22.

†**Texas** — IMPROVEMENTS — U. S. Eng., Fort Sam Houston, Oct. 22, imprvs., Spec 42-451, from A. L. Wyman & Son, 1038 Hendricks St., Dallas. **$100,000-$500,000.** CD 10/15.

★**Wash., Seattle**—PIER SUBSTRUCTURE—Port Seattle Comn., Bell St. Terminal, Oct. 29, substructure for north pier, Connecticut St. terminal, from General Constr. Co., 3840 Iowa St., **$1,794,150.** CD 10/26.

CONTRACTS AWARDED

†**Arizona**—PAINTING—U. S. Eng., 751 S. Figueroa St., Los Angeles, Calif., painting, Maricopa Co., to J. A. Bridges, 822 N. 9 St., Phoenix, under **$50,000.**

†**Arkansas**—STORAGE SYSTEM—U. S. Eng., P. O. Box 97, Memphis, Tenn. bulk gasoline storage sys., Lawrence Co., to T. R. Cotter (Cotter Plumbing & Heating Co.) Columbian Mutual Trust Bldg., Memphis, Tenn., under **$50,000.** CD 10/20.

†**Arkansas** — STORAGE SYSTEMS — U. S. Eng., P. O. Box 97, Memphis, Tenn., bulk gasoline storage sys., Mississippi Co., to Thomas R. Cotter, (Cotter Plumbing & Heating Co.), Columbian Mutual Trust Bldg., Memphis, Tenn., under **$50,000.** Bids 10/20. CD 10/20.

†**Arkansas**—IMPROVEMENTS—U. S. Eng., P. O. Box 97, Memphis, Tenn., imprvs, seeding, Greene Co., to Crittenden Constr. Co., West Memphis, Ark., under **$50,000.**

†**California** — GASOLINE STORAGE — U. S. Eng., 74 New Montgomery St., San Francisco, gasoline storage facilities, San Luis Obispo Co., to Western Well Drilling Co. Ltd., 522 W. Santa Clara St., San Jose. Awarded 10/28.

†**California**—FIRE ALARM SYSTEM—U. S. Eng., 74 New Montgomery St., San Francisco, fire alarm sys. Alameda Co., to American District Telegraph Co., 150 Post St., San Francisco. Awarded 10/28.

†**California** — GASOLINE STORAGE — U. S. Eng., 74 New Montgomery St., San Francisco, gasoline storage, facilities, Alameda Co., to Underground Constr. Co., 354 Hobart St., Oakland. Awarded 10/26.

†**California** — GASOLINE STORAGE — U. S. Eng., 74 New Montgomery St., San Francisco, gasoline storage, facilities, Humboldt Co., to A. Brizard, Inc., Arcata. Awarded 10/26.

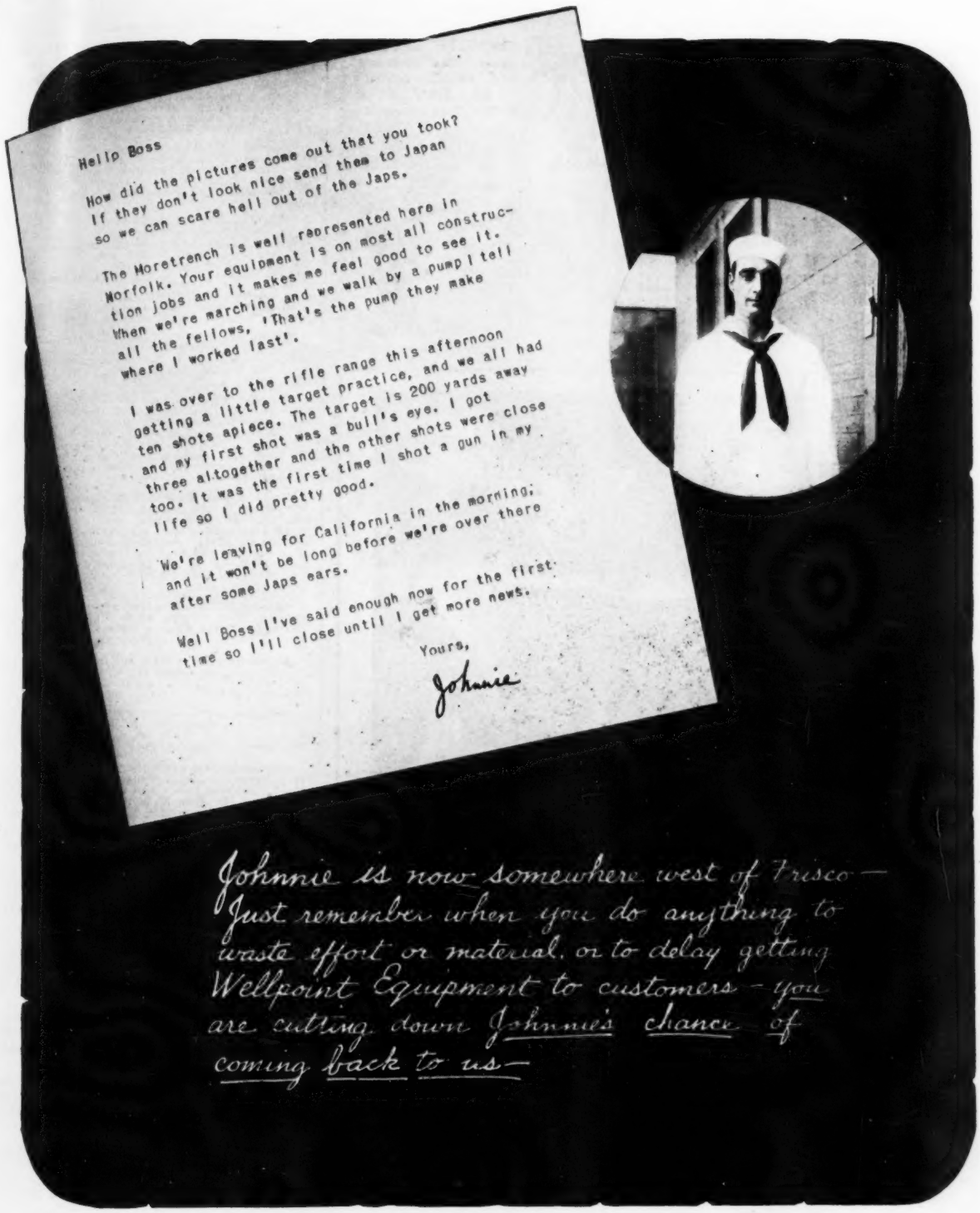
†**California**—IMPROVEMENTS—U. S. Eng., 751 S. Figueroa St., Los Angeles, imprvs., San Bernardino Co., to C. E. Osborn, Sierra Madre Villa Ave., Pasadena. **$100,000-$500,000.**

†**California**—SPRINKLER SYSTEMS—U. S. Eng., 751 S. Figueroa St., Los Angeles, automatic sprinkler sys., Inyo Co., to Automatic Sprinklers of the Pacific, Inc., 5508 Alhambra Ave., Los Angeles, under **$50,000.**

†**California**—SPRINKLER SYSTEMS—U. S. Eng., 751 S. Figueroa St., Los Angeles, automatic sprinkler sys., Yuma Co., to Automatic Sprinklers of the Pacific, Inc., 5508 Alhambra Ave., Los Angeles, under **$50,000.**

†**California**—UTILITIES—U. S. Eng., 74 New Montgomery St., San Francisco, utilities, San Luis Obispo Co., to Doudell Constr. Co., Box 488, San Jose. Awarded 10/26.

★†**Calif., San Diego**—FACILITIES—Yards & Docks, Navy Dpt., 18 St. and Constitution Ave. N.W., Wash., D. C., Supplementary Agreement 2, addnl. facilities, NOY 4205, to M. H.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I was over to the rifle range this afternoon getting a little target practice, and we all had ten shots apiece. The target is 200 yards away and my first shot was a bull's eye. I got three altogether and the other shots were close too. It was the first time I shot a gun in my life so I did pretty good.
We're leaving for California in the morning, and it won't be long before we're over there after some Japs ears.
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UNCLASSIFIED (Contracts Awarded; Contd.)

Golden & W. Trepte, 3485 Noell St., $3,501,800. Additional to CD 5/6—ENR 5/14 under CA.

†**Florida** — CLEARING, etc. — U. S. Eng. U. S. Courthouse & Post Office, Jacksonville, clearing, grubbing, grading, drainage, paving, electrical installation, Taylor Engr. to Cone & Manley, Caesar Ave. and Cumberland St., Tampa, **$100,000-$500,000.**

†**Florida** — CLEARING, etc. — U. S. Eng. U. S. Courthouse & Post Office, Jacksonville, clearing, grubbing, grading, drainage, paving, etc., Collier Co., to Maurice J. Connell & Associates, Langford Bldg., Miami, **$50,000-$100,000.**

†**Florida** — CLEARING, etc. — U. S. Eng. U. S. Courthouse & Post Office, Jacksonville, clearing, grubbing, grading, drainage, paving, electrical installation, etc., Palm Beach Co., to Cleary Bros. Constr. Co., Comeau Bldg., West Palm Beach, **$100,000-$500,000.**

†**Georgia** — IMPROVEMENTS — U. S. Eng. Post Office Bldg., Savannah, imprvs., Camden Co., to E. J. Smith, Hurt Bldg., Atlanta.

†**Idaho** — LUBRICATING SYSTEM — U. S. Eng., Pittock Blk., Portland, Ore., lubricating and oil sys., Power Co., to Morrison Knudsen Co., 319 Bway., Boise and J. W. Brennan, Pocatello.

†**Illinois**—CLEARING, etc.—U. S. Eng., 800 U. S. Court House & Custom House, St. Louis, Mo., clearing, grubbing, grading, site, roads, parking and storage areas, frame bldgs., wash racks, etc., Neg. 11-3-43-74, Jefferson Co., to J. Emil Anderson & Son Const. Co., c/o H. Anderson, Jefferson Hotel, St. Louis, Mo. Est. **$100,000-$500,000.**

†**Ind., Burns City**—SITE IMPROVEMENT, etc.—Pub. Housing Auth., NHA, 201 N. Wells St., Chicago, site imprv., utilities, incl. overhead electrical distr. sys., water distr. sys., sewers, grading roads, paving, lawns and planting, for 350 unit prefabricated dwellings, Ind-12093, to N. E. Daugherty Constr. Co., Bloomington, **$158,228.** CD 10/26—ENR 10/28 under CA.

†**Kansas**—IMPROVEMENTS—U. S. Eng., 416 Wright Bldg., Tulsa, Okla., imprvs., grading, drainage, Pratt Co., to Geiger & Rutherford, Leavenworth. CD 8/25—ENR 8/27.

Massachusetts — AIR PIPING — Industrial Company, compressed air piping sys., to J. G. Lamotte & Son, Inc., 98 Granite St., South Boston. **$31,721.**

†**Massachusetts**—UTILITIES—U. S. Eng., 1 and Douglas Sts. N.W., Wash., D. C., utilities, Bristol Co., to G. E. Duteau, 90 Cloran St., Springfield, under **$50,000.**

†**Massachusetts** — CONSTRUCTION — U. S. Eng., 819 Industrial Trust Bldg., Providence, R. I., construction, No. 699-43-92, Hampden Co., to J. G. Roy & Sons Co., 21 Silver St., Springfield. Est. under **$50,000.** Bids 10/20.

Massachusetts — IMPROVEMENTS — Industrial Company, imprvs., to Temple & Crane, Inc., 80 Federal St., Boston. Est. **$42,000.**

†**Massachusetts**—RAILROAD SIDINGS—U. S. Eng., 819 Industrial Trust Bldg., Providence, R. I., railroad sidings, Hampden Co., to Walter E. Lovelace, Inc., Memorial Ave., West Springfield. Est. under **$50,000.**

†**Massachusetts** — IMPROVEMENTS — Yards & Docks, Navy Dpt., 18 St. and Constitution Ave. N.W., Wash., D. C., electrical contract for imprvs., to Hatzel & Buehler, Inc., 420 Lexington Ave., New York, N. Y. CD 10/20 under CA.

★†**Michigan**—FENCING, etc.—U. S. Eng., 700 Union Guardian Bldg., Detroit, fencing, gates, Genesee Co., to Barnes Wire Fence Co., 10371 Northlawn St., Detroit, less than **$1,000,000.**

★†**Michigan**—FENCING—U. S. Eng., 700 Union Guardian Bldg., Detroit, fencing, Iosco and Chippewa Counties, to Marleau-Hercules Fence Co., 3602 Detroit St., Toledo, O., less than **$1,000,000.**

†**Nebraska**—IMPROVEMENTS—U. S. Eng., 1709 Jackson St., Omaha, imprvs., drainage sys., Dodge Co., to E. A. Kramme Co., Inc., 402 Teachout Bldg., Des Moines, Ia., and Jensen Constr. Co., 1527 12 St., Des Moines, Ia. CD 10/6—ENR 10/8 under CA.

†**New York**—CONSTRUCTION—U. S. Eng., 120 Wall St., New York, construction, Queens Co., to E. W. Jackson Contg. Co., Inc., 24 Kellum Pl., Hempstead, **$100,000-$500,000.**

★†**New York** — IMPROVEMENTS — U. S. Eng., 120 Wall St., New York, N. Y., imprvs., Dutchess Co., to Garofano Constr. Co., 730 S. Columbia Ave., Mt. Vernon, **$500,000-$1,000,000.**

†**New York** — PLUMBING and HEATING SYSTEM—New York Port of Embarkation Army Base, 1 Ave. and 58 St., Brooklyn, rehabilitating plumbing and heating sys., Kings Co., to Schap Bldg. Corp., 136 W. 65 St., New York, under **$50,000.**

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Comn., 270 Madison Ave., New York, and **Long** Island R. R. Co., C. P. Adams, ch. **engr**; Penna. Sta., New York, contr. 19, station finish, Woodhaven Junction and East New York Pedestrian Subways, Spec. No. 2711, to Kuhn, Smith & Harris, Inc., 114 W. 31 St., New York, **$36,588.**

†**Ohio**—WIND TUNNEL, etc.—National Advisory Com. for Aeronautics, E. R. Sharpe, equip., to Pittsburgh-Des Moines Steel Co., Neville Island, Pittsburgh, Pa.

†**Oklahoma** — ELECTRIC SYSTEM — U. S. Eng., 231 W. Main St., Denison, Tex., electric sys., incl. fire alarm **sys.** and sprinkler sys., Grady Co., to American Dlatrict Telegraph Co., 400 N. Bway., Oklahoma City, **$50,000.** **$100,000.** CD 9/18—ENR 9/24.

†**Oklahoma**—IMPROVEMENTS—U. S. Eng., 416 Wright Bldg., Tulsa, imprvs., clearing, grading, drainage, paving, Ellis Co., to H. J. Hall, **6455 High Dr., Kansas City, Mo. $100,000.** **$500,000.** CD 10/13—ENR 10/15.

†**Tennessee**—IMPROVEMENTS—U. S. Eng., P. O. Box 97, Memphis, imprvs., Henry Co., to H. K. Smith, Bruceton, under **$50,000.** CD 10/20.

†**Texas**—LEAN TO—U. S. Eng., Fort Sam Houston, lean-to addn., altering bldg., installing air conditioning **sys.** Spec. 42-490, Bexar Co., to Harris & Beeman, Inc., 509 E. 3 St., Fort Worth, under **$50,000.** Bids about 10/17. CD 10/13.

Tex., Corpus Christi—OIL WELL—R. H. Hawn, **Corpus** Christi, drilling, setting 5½ in. casing, developing 6,000 ft. deep, oil well test, force account, **$48,000.**

Texas and **New Mexico**—GRADING—Atchison, Topeka & Santa Fe Ry., T. A. Blair, ch. engr. (western lines), Amarillo, Tex., grading work for 10 mi. doubletrack between Farwell, Tex. and Clovis, **N. M.**, to Morrison-Knudsen Co., 411 W. 5 St., Los Angeles, Calif. **$210,000.**

†**Texas**—AIR CONDITIONING SYSTEM—U. S. Eng., Fort Sam Houston, air-conditioning **sys.**, Spec. 42-440, Medina Co., to Carrier-Bock Corp., 708 N. Harwood St., Dallas, under **$50,000.** Bids 10/17. CD 10/13.

†**Texas** — ATHLETIC FACILITIES — U. S. Eng., Fort Sam Houston, athletic facilities, baseball, football grandstands, water, gas, sewer lines and facilities, grading, drainage, leveling, sodding, athletic field, fencing, boxing ring, etc. Spec. 42-506, Bastrop Co., to R. E. McKee, 1918 Texas St., El Paso, **$50,000-$100,000.** CD 10/6.

†**Texas**—CLEARING, etc.—U. S. Eng., Fort Sam Houston, clearing, grubbing, etc., to Briggs & Killian, Sunset Rd., San Antonio, under **$50,000.** Additional to CD 9/23—ENR 10/1, under CA.

†**Texas**—ELECTRICAL DISTRIBUTION, etc.—U. S. Eng., Fort Sam Houston, electrical distr., fire station, gas station, motor repair shop, grease and wash racks, paving, etc., Tarrant Co., Spec. 42-393, to Caln & Caln, Majestic Bldg., Fort Worth. **$50,000-$100,000.** Bids about 10/17. CD 10/13.

†**Texas**—FACILITIES—U. S. Eng., Fort Sam Houston addnl. facilities, Bastrop Co., to R. E. McKee, 1918 Texas St., El Paso, under **$50,000.** CD 10/19—ENR 10/22, under CA.

†**Texas**—GROUNDS DEVELOPMENT, etc.—U. S. Eng., Fort Sam Houston, grounds development, etc., Bexar Co., to C. L. Browning, Jr., 812 Insurance Bldg., San Antonio, under **$50,000.** Additional to CD 4/28—ENR 4/30, under CA.

†**Texas**—IMPROVEMENTS—U. S. Eng., 25 St. and Avenue F, Galveston, imprvs., McLennan Co., to Ballantyne Eng. Co., 945 Esperson Bldg., Houston, **$100,000-$500,000.**

★ †**Texas**—IMPROVEMENTS—U. S. Eng., 25 St. and Avenue F, Galveston, imprvs., to Heldenfels Bros., Corpus Christi, **$1,000,000-$5,000,000.**

†**Texas**—IMPROVEMENTS—U. S. Eng., Fort Sam Houston, imprvs., McLennan Co., No. W359-eng-4835, to M. C. Winters, 610 Littlefield Bldg., Austin, under **$50,000.**

†**Texas** — STEAM DISTRIBUTION — U. S. Eng., Fort Sam Houston, supplemental contract, addn. steam distr. sys. unit, Bexar Co., to H. B. Kilstofte, 507 Builders Exchange Bldg., San Antonio, under **$50,000.** CD 6/22—ENR 6/25, under Public Bldgs., CA.

†**Utah**—RADIO REPAIR—U. S. Eng., 32 Exchange Pl., Salt Lake City, radio repair bldg., Weber Co., to Spencer Lane Constr. Co., 251 Kearny St., San Francisco, Calif., under **$75,000.** Bids 10/22.

★ †**Va., Norfolk**—PIER, etc.—Yards & Docks, Navy Dpt., 18 St. and Constitution Ave. N.W., Wash., D. C., pier, etc., NOY 5777, to Tidewater Constr. Co., 547 Front St., **$2,100,000.**

†**Washington**—CONVEYOR EQUIPMENT—U. S. Eng., 800 3 Ave., Seattle, coal conveyor equip. for steam plant, Spokane Co., to Link-Belt, Pacific Div., 820 1st Ave. S., Seattle, under **$50,000.**

†**Washington** — ELECTRICAL DISTRIBUTION—U. S. Eng., 800 3 Ave., Seattle, elec-

FULCRUM-TYPE LIFT takes the load off the cables. Jack arm acts as a lever—giving amazingly fast lifting action with little strain, avoiding direct cable pull.

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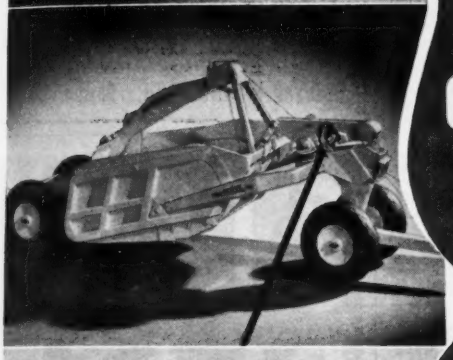

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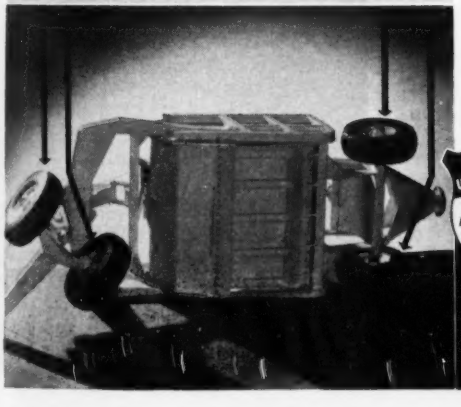

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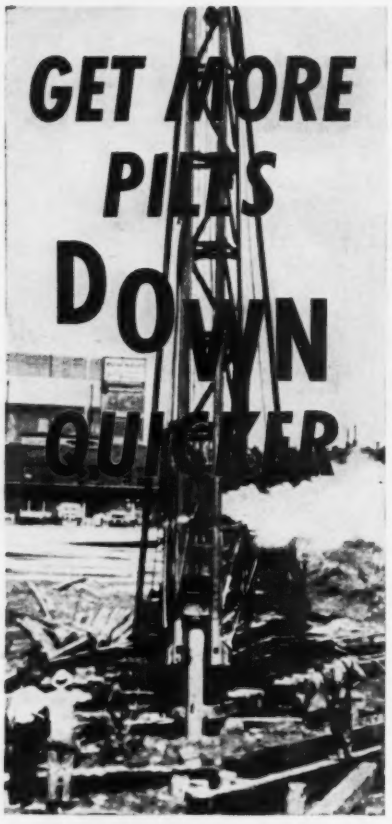

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trical distr. sys., Spokane Co., to Electric Smith, E. 121 Sprague Ave., Spokane, **$50,000-$100,000.**

†Washington—FENCING—U. S. Eng., 800 3 Ave., Seattle, 2 contracts, fencing, Snohomish Co., to Chisholm & Elford, Box 54, Bellingham, each less than **$50,000.**

†Wash., Puget Sound—CAISSON—Yards & Docks, Navy Dpt., 18 St. and Constitution Ave. N.W., Wash., D. C., steel caisson, NOY 5755, to Amos Shipbuilding & Dry Dock Co., 3200 26 Ave. S.W., Seattle, **$350,000.**

PUBLIC BUILDINGS

PROPOSED WORK

†California—H. J. Kaiser Co., Latham Sq. Bldg., Oakland, hospital addn. and children's nursery. Federally financed.

†Conn., Bristol — Bristol Hospital, Inc., Newall Rd., plans by C. S. Palmer, 75 Whitney Ave., New Haven, 1 story, brick hospital addn. $158,700. **FWA gr.**

†Conn., East Hartford (Br. Hartford)—Bd. Educ., East Hartford, plans by R. F. Barker, 17 Staples Pl., West Hartford, frame school, Forbes and Hill Sts. $105,000. **FWA.** CD 5/25—ENR 5/28.

†D. C., Wash.—Federal Works Agency, 18 and F Sts. N.W., hospital bldg. for Garfield Hospital, 10 St. and Florida Ave. N.W.

†Georgia—U. S. Eng., Marietta, bldg., Cobb Co.

†Kansas—U. S. Eng., 416 Wright Bldg., Tulsa, Okla., bids soon frame bldgs., grading, underground utilities, Pratt Co. $300,000. Plans deposit $65.

★**†New York**—U. S. Eng., Chimes Bldg., Syracuse, bldg., Oneida Co. **$5,000,000.**

†N. Y., North Tonawanda—Federal Works Agency, 2 Lafayette St., New York, plans by F. J. and W. J. Kidd, 524 Franklin St., Buffalo, 1 story, bsmnt. main bldg. addn., and 2 story, bsmnt. addn. maternity sect. De Graff Memorial Hospital. $236,000.

†Ohio—Republic Steel Corp., Republic Bldg., Cleveland, plant. $450,000. Federally financed.

†Texas — Pub. Housing Auth., NHA, 1309 Electric Bldg., Fort Worth, plans by H. F. Kuehne, B. Giesecke, R. M. Brooks, 904 Littlefield Bldg., Austin, housing, utilities, connections, etc. $450,000.

★**†Texas**—Pub. Housing Auth., NHA, Electric Bldg., Fort Worth, frame type houses. $1,125,000.

★**†Texas**—Pub. Housing Auth., NHA, Electric Bldg., Fort Worth, frame type houses $1,350,000.

★**†Texas**—Pub. Housing Auth., NHA, Electric Bldg., Fort Worth, frame type houses. $1,125,000.

BIDS ASKED

Bids Asked November 7

★**†Ga., Brunswick**—Pub. Housing Auth., NHA, Georgia Savings Bank Bldg., Peachtree and Broad Sts., Atlanta, 800 unit dormitories, Ga-9123; 500 unit demountable housing, Ga-9124. Abreu & Robeson, Brunswick, archts. CD 10/16—ENR 10/22.

Bids Asked November 9

★**†N. Y., Massena**—Pub. Housing Auth., NHA, 270 Bway., New York, 300 unit dormitories, NY-30085 and 300 unit dormitory apartments, NY-30084. Mayer-Whittlesey, 31 Union Sq., New York, archts. CD 10/19—ENR 10/22.

Bids Asked November 10

†D. C., Wash.—Pub. Housing Auth., NHA, Temporary Bldg. 2, 19 and D Sts. N.W., 64 unit permanent housing, DC-1-12. L. Justement, 1223 Connecticut Ave., archt. CD 10/12—ENR 10/15.

Bids Asked November 12

†Pennsylvania—Pub. Housing Auth., NHA, 270 Bway., New York, N. Y., demountable housing, Pa. 36284. Demechick & Supowitz, 220 S. 16 St., Phila., archts. Extended date. CD 10/12—ENR 10/15 under BA.

★**†Ga., Savannah**—Pub. Housing Auth., NHA, Georgia Savings Bank Bldg., Peachtree and Broad Sts., Atlanta, 850 unit demountable housing, Ga-9045. C. W. Bergen, 1013 Liberty Bank Bldg., archt. CD 9/23—ENR 10/1.

★**†Virginia**—Pub. Housing Auth., NHA, Temporary Bldg. 2, 19 and D Sts., N.W., Wash., D. C., 500 unit demountable housing, Va-44018. Faulkner & Kingsburg, 917 15 St., Wash., D. C., archts.

★**†Virginia**—Pub. Housing Auth., NHA, Temporary Bldg. 2, 19 and D Sts., N.W., Wash., D. C., 1,050 unit demountable housing, VA-44019. Murphy & Locraft, 1413 H St. N.W., Wash., D. C., archts.

Bids Asked November 13

†Nevada—U. S. Eng., 4792 Sepulveda Blvd., San Bernardino, Calif., bldgs., Spec. 71C, Clark Co.

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PUBLIC BUILDINGS (Bids Asked, Cont'd.)

Bids Asked November 14

★†**D. C., Wash.**—Pub. Housing Auth., NHA, Temporary Bldg. 2, 19 and D Sts. N.W., 86 unit demountable housing, Canal St. DC-49055, 20 unit demountable housing, Canal St., DC-49059, T. Holden-McLaughlin Assoc., 570 Lexington Ave., New York, N. Y., archts; 200 unit demountable housing, DC-49060, Alley Dwelling Auth., archts.

Bids Asked November 15

★†**Va., Jefferson Davis**—Pub. Housing Auth., NHA, Temporary Bldg. 2, 19 and D Sts. N.W., Wash., D. C., 720 unit demountable housing, VA-44231, 45191, Heaton & Chatelain, 1727 K St., Wash., D. C., archts.

Bids Asked November 16

★†**Ark., Bauxite**—Pub. Housing Auth., NHA, Electric Bldg., 7 and Taylor Sts., NHA, Fort Worth, Tex., 1,205 unit temporary housing, Ark-3049. CD 10/16—ENR 10/22.

†**Md., Cedar Point**—Pub. Housing Auth., NHA, Temporary Bldg. 2, 19 and D Sts. N.W., Wash., D. C., 150 unit demountable housing, Md.-18191. Eli Jacques Kahn & R. A. Jacobs, 1625 Connecticut Ave., Wash., D. C., archts. CD 10/19—ENR 10/29.

★†**Miss., Aberdeen**—Pub. Housing Auth., NHA, Georgia Savings Bank Bldg., Peachtree and Broad Sts., Atlanta, Ga., 290 unit temporary housing, Miss-22121; 160 unit dormitory apartments, Miss-22122. N. W. Overstreet, 1221-25 Standard Life Bldg., Jackson, archt. CD 10/22—ENR 10/29.

†**Tenn., Tullahoma**—Pub. Housing Auth., NHA, Georgia Savings Bank Bldg., Peachtree and Broad Sts., Atlanta, Ga., 100 unit permanent housing, Tenn-40053; 75 unit dormitory apartments, Tenn-40052. F. B. Warfield of Warfield & Keeble, Nashville Trust Bldg., Nashville, archt. CD 10/8—ENR 10/15.

★†**Wash., Renton**—Pub. Housing Auth., NHA, Skinner Bldg., 5 Ave. and Union St., Seattle, 420 unit dormitory apartments, Wash-45146; 580 unit dormitory apartments, Wash-45136. Geo. Wellington & Stoddard, 412 Orpheum Bldg., Seattle, archts. CD 10/19—ENR 10/22 under Seattle.

Bids Asked November 17

★†**Tex., Texarkana**—Pub. Housing NHA, Electric Bldg., 7 and Taylor Sts., Fort Worth, 770 unit dormitories, Tex.-41144. CD 10/19—ENR 10/22.

†**Calif., Watsonville**—Office District Engineer Pub. Bldgs., Admin., 508 16 St., Latham Square Bldg., Oakland, interior and exterior painting U. S. Post Office.

†**Wisconsin**—Pub. Housing Auth., NHA, 201 N. Wells St., Chicago, Ill., housing. Tentative date. Bogner, Darby, Law & Potter, 759 N. Milwaukee St., Milwaukee, archts. CD 10/6—ENR 10/8.

Bids Asked November 18

★†**O., Akron**—Pub. Housing Auth., NHA, 9 St. and Prospect Ave., Cleveland, 500 unit demountable housing, Ohio-33013.

★†**O., Marion**—Pub. Housing Auth., NHA, 9 St. and Prospect Ave., Cleveland, 500 unit permanent housing, Ohio-33143. Extended date. CD 10/26—ENR 10/29.

★†**Tex., Borger**—Pub. Housing Auth., NHA, Electric Bldg., 7 and Taylor Sts., Fort Worth, 200 unit permanent housing, Tex.-41331; 86 unit dormitories, Tex-41332. W. C. Townes, 1208 W. 10 Ave., Amarillo. CD 10/16—ENR 10/22.

Bids Asked November 20

★†**D. C., Wash.**—Pub. Housing Auth., NHA, Temporary Bldg. 2, 19 and D Sts. N.W., 302 unit permanent housing, DC-1-6. G. Howe, Bulletin Bldg., Phila., Pa., archt. CD 10/12—ENR 10/15.

★†**Ore., Portland**—Pub. Housing Auth., NHA, Skinner Bldg., 5 Ave. and Union St., Seattle, Wash., 6,000 unit temporary housing, Ore-35057. CD 10/16—ENR 10/22.

★†**Wash., Vancouver**—Pub. Housing Auth., NHA, Skinner Bldg., 5 Ave. and Union St., Seattle, 1,000 unit dormitories, Wash-45171.

Bids Asked November 21

†**Ariz., Douglas**—Pub. Housing Auth., NHA, 785 Market St., San Francisco, Calif., 90 unit dormitory apartments, Ariz-2052; 60 unit temporary housing, Ariz-2053.

★†**Calif., Benicia**—Pub. Housing Auth., NHA, 785 Market St., San Francisco, 200 unit dormitory apartments, Cal-4019; 200 unit temporary housing, Cal-441. CD 10/27—ENR 10/29.

★**Maryland**—Pub. Housing Auth., NHA, Temporary Bldg. 2, 19 and D Sts., N.W., Wash., D. C., 420 unit demountable housing, Md-18211. Skidmore, Owings & Merrill, 5 E. 57 St., New York, N. Y., archts.

★†**S. C., Charleston**—Pub. Housing Auth., NHA, Georgia Savings Bank Bldg., Peachtree and Broad Sts., Atlanta, Ga., 200 unit dormitories, SC-38067; 500 unit dormitory apartments, SC-38065; 1,000 unit temporary housing, SC-38069. CD 10/29.

★†**Pennsylvania**—Pub. Housing Auth., NHA, 270 Bway., New York, N. Y., housing,

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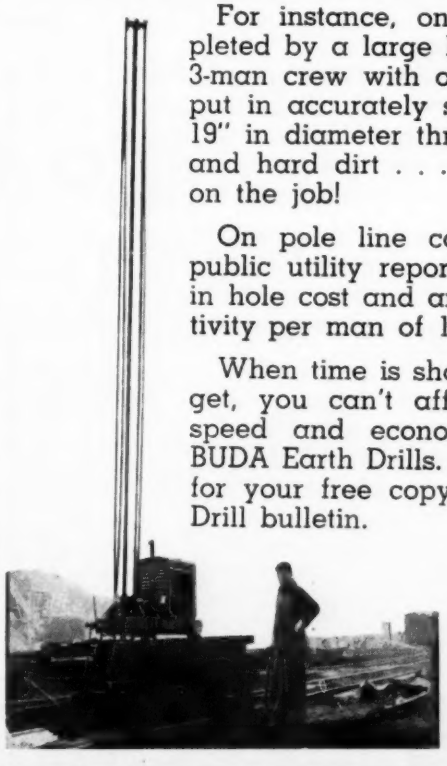

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PUBLIC BUILDINGS (Bids Asked, Cont'd.)

Pa. 36241. E. A. Stopper & S. K. Lichty, Liberty Trust Bldg., Phila., archts. CD 10/6—ENR 10/8.

Bids Asked November 24

★†**Ala., Mobile**—Pub. Housing Auth., NHA, Georgia Savings Bank Bldg., Peachtree and Broad Sts., Atlanta, Ga., 1,500 unit demountable housing, Ala-1161.

★†**Md., Elkton**—Pub. Housing Auth., NHA, Temporary Bldg. 2, 19 and S Sts. N.W., Wash., D. C., 496 unit dormitories, Md. 18154 G. Morris Whiteside, II, Dupont Bldg., Wilmington, Del., archts. CD 10/22—ENR 10/29.

★†**Miss., Pascagoula**—Pub. Housing Auth., NHA, Georgia Savings Bank Bldg., Peachtree and Broad Sts., Atlanta, Ga., 1,000 unit temporary housing, Miss-22029.

Bids Asked November 26

†**Fla., Fort Myers**—Pub. Housing Auth., NHA, Georgia Savings Bank Bldg., Peachtree and Broad Sts., Atlanta, Ga., 100 unit dormitory apartments, Fla-8162; 60 unit temporary housing, Fla-8163.

Bids Asked November 27

†**Tex., Port Arthur**—Office District Engineer Pub. Bldgs., Admin., 550 Post Office, Dallas, exterior and interior painting and miscellaneous repairs, U. S. Post Office.

★†**Wyo., Cheyenne**—Pub. Housing Auth., NHA, Dierks Bldg., 10 and Grand Ave., Kansas City, Mo., 225 unit dormitory apartments, Wyo.-48011.

Bids Asked About December 15

★†**Oregon**—Pub. Housing Auth., NHA, Skinner Bldg., 5 Ave. and Union St., Seattle, Wash., housing, $1,500,000. R. L. Morin, Public Serv. Bldg., Portland, archt.

Bids Asked

†**Rhode Island**—U. S. Eng., 819 Industrial Trust Bldg., Providence (selected list bidders), bldg., No. 699-43-91.

†**Texas**—U. S. Eng., Fort Sam Houston, bldgs. $150,000; clearing, grubbing, boundary fencing, etc., $200,000, all in Maverick Co. Plans deposit $75. CD 10/20—ENR 10/29.

†**Texas**—U. S. Eng., 25 St. and Avenue F, Galveston, bldg., underground utilities, McClellan Co. $80,000. Plans deposit $25.

†**Texas**—U. S. Eng., 25 St. and Avenue F, Galveston, bldgs., water, sewer, gas line extens., hard paving, drainage, Victoria Co. $200,000. Plans deposit $50.

LOW BIDDERS

†**Connecticut**—Pub. Housing Auth., NHA, 24 School St., Boston, Mass., Oct. 27, permanent housing, etc. Conn. 6017, from A. E. Stephens Co., 1200 Main St., Springfield, Mass., **$409,000.** CD 10/22—ENR 10/8.

†**D. C., Wash.**—District Comrs., District Bldg., Oct. 28, addn. Gallinger Hospital, DC-49-140, from CMH Co., 316 Randolph Pl. N.E. **$480,000. FWA.**

★†**Missouri**—Pub. Housing Auth., NHA, 170 Dierks Bldg., Kansas City, Mo., Oct. 23, demountable prefabricated housing units, site development work, sanitary and storm sewers, water distr., lawns, planting, Defense Housing Proj. 23028, St. Charles Co., from J. Wuellner & Son Constr. Co., Oak and Front Sts., Alton, Ill., **$624,750.** CD 10/13—ENR 10/15.

†**Pennsylvania** — Washington Co. Housing Auth., Washington, general contract housing, Project Pa. 17-1, for NHA, from Jas. J. Bendik, 6 Gilmore St., Uniontown **$290,000***** plumbing, from McVehil Plumbing Co., 40 E. Wheeling St., Washington, **$47,518***** heating, from Harry Dougherty & Son, Freeport, **$23,735***** electrical work, from Electric Service Co., Brownsville, **$12,080.** CD 10/15—ENR 10/15.

†**Wash., Ampere**—Bonneville Power Admin., P. O. Box 3537, Portland, Ore., furnishing instrument transformers, Inv. 2923, from Allis Chalmers Mfg. Co., 1126 S. 70 St., Milwaukee, Wis. **$25,770.**

CONTRACTS AWARDED

†**Alabama**—U. S. Eng., 494 S. Spring St. N.W., Atlanta, Ga., housing, Calhoun Co., to Hallman Bros., 625 Spring St. N.W., Atlanta, Ga.

★†**Ala., Mobile**—Pub. Housing Auth., NHA, Georgia Savings Bank Bldg., Peachtree and Broad Sts., Atlanta, Ga., fabrication, erection, general construction, etc., 400 unit temporary dwellings, Ala-1101, to Green Lumber Co., Laurel, Miss., **$1,128,240.** W. H. March, Meaher Bldg., Mobile, archt.

†**California**—U. S. Eng., 74 New Montgomery St., San Francisco, addnl. bldgs., Solano Co., to P. C. Gibson, 372 Velarde St., Mountain View. Awarded 10/28.

†**California**—U. S. Eng., 74 New Montgomery St., San Francisco, bldgs., San Mateo Co., to Conway & Culligan, Monadnock Bldg., San Francisco. Awarded 10/28.

†**California**—U. S. Eng., 751 S. Figueroa St., Los Angeles, temporary frame bldgs., Los Angeles Co., to E. G. Martin, 596 Conch Ave., Altadena, A. Jensen, M. S. Jepson, 1730 S. Hayworth Ave., Los Angeles, **$100,000-$500,000.**

†**California**—U. S. Eng., 1209 8 St., Sacramento, bldgs., Sacramento Co., to Guy E. Hall, 1326 30 St., Bakersfield.

†**California**—U. S. Eng., 751 S. Figueroa St., Los Angeles, temporary frame bldgs., San

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PUBLIC BUILDINGS (Contracts Awarded, Cont'd.)

Bernardino Co., to M. J. Brock & Sons, Inc., 187 N. Larchmont Blvd., Davies & Keusder, 187½ N. Larchmont Blvd., Los Angeles, **$100,000-$500,000.**

†**California**—U. S. Eng., 751 S. Figueroa St., Los Angeles, bldg., grading, paving, fencing, San Bernardino Co., to H. W. Raun, 1026 Grinnell Dr., and J. F. Cummins, 245 E. Olive Ave., Burbank. **$100,000-$500,000.**

★†**Calif., Santa Margarita**—Yards & Docks, Navy Dpt., 18 St. and Constitution Ave. N.W., Wash., D. C., Supplementary Agreement 1, Marine Corps Training Area, NOY 5468, to Engineers Ltd. and J. H. Haddock, Ltd., 225 Bush St., San Francisco, **$9,681,940.** Awarded 10/16. Additional to CD 8/28—ENR 9/3, under CA.

★†**Connecticut**—Pub. Housing Auth., NHA, 24 School St., Boston, Mass., housing, Conn. 6055 and 6056, to E & F Constr. Co., 94 Wells St., Bridgeport, **$1,752,000.** Bids 10/22. CD 10/27—ENR 10/29, under LB.

★†**D. C., Bellevue**—Yards & Docks, Navy Dpt., 18 St. and Constitution Ave. N.W., Wash., Supplementary Agreement 1, addnl. facilities, NOY 5709, to Skinker & Garrett, 1719 I St. N.W., Wash., **$510,000.** Awarded 10/21. Additional to CD 9/2 under CA.

†**Florida**—U. S. Eng., U. S. Courthouse & Post Office, Jacksonville, temporary frame bldgs., Duval Co., to Paul Smith Const. Co., 320 N. Rome Ave., Tampa, **$100,000-$500,000.**

†**Georgia**—U. S. Eng., Post Office Bldg., Savannah, addnl. bldgs., Liberty Co., to Goldschmidt & Bethune, 1st Natl. Bank Bldg., Atlanta. CD 10/23—ENR 10/29.

†**Georgia**—U. S. Eng., U. S. Courthouse & Post Office, Jacksonville, Fla., bldgs., Lowndes Co., to J. N. Bray Const. Co., Valdosta.

†**Illinois**—U. S. Eng., 800 U. S. Courthouse & Custom House, St. Louis, Mo., bldgs., Madison Co., to Bank Building & Equipment Co., 906 Sidney St., St. Louis, Mo. Est. **$100,000-$500,000.**

†**Louisiana**—U. S. Eng., foot of Prytania St., New Orleans, addnl. facilities, Inv. 43-151, to J. M. Brown Constr. Co., Shreveport. Awarded 10/24.

†**Louisiana**—U. S. Eng., foot of Prytania St., New Orleans, addnl. military housing, to Barnet Brezner, Alexandria. Awarded 10/24.

★†**Louisiana**—Defense Plant Corp., 811 Vermont Ave. N.W., Wash., D. C., 2 plants, to H. K. Ferguson Co., 1660 Hanna Bldg., Cleveland, O. Est. **$5,000,000** each. Industrial Company will operate.

†**Massachusetts**—Industrial Company, plant, to E. J. Rappoli Co. Inc., 515 Massachusetts Ave., Cambridge. Est. **$40,000.** Federally financed.

★†**Michigan**—U. S. Eng., 700 Union Guardian Bldg., Detroit bldgs., Macomb Co., to C. N. Board, 22427 Gratiot St., Detroit, less than **$1,000,000;** 24,000 volt sub-station, Macomb Co., to General Electrical Eng. Co., 2148 Gratiot St., Detroit, less than **$1,000,000.**

★†**Mississippi**—Industrial Company, housing, Jackson Co., to J. A. Jones Constr. Co., Charlotte, N. C. Est. **$500,000.** Awarded 10/24. J. B. Smith, Martin Bldg., Birmingham, Ala., archt. Federally financed.

★†**Neb., Hastings**—Yards & Docks, Navy Dpt., 18 St. and Constitution Ave. N.W., Wash., D. C., bldgs., NOY 5692, to Maxon Constr. Corp., Inc., 131 N. Ludlow St., Dayton, O., **$26,290,466.** Additional to CD 7/7 under CA. Awarded 10/21.

★†**Nev., Hawthorne**—Yards & Docks, Navy Dpt., 18 St. and Constitution Ave. N.W., Wash., D. C., Supplementary Agreement 3, addnl. facilities, NOY 5401, to Wm. P. Nell Co. Ltd., 4814 Loma Vista Ave., Los Angeles, Calif., **$5,966,000.** Awarded 10/19. Additional to CD 10/22, under CA.

†**New Mexico**—U. S. Eng., Albuquerque, bldg., Curry Co., to Lawless & Alford, Paris, Tex., **$100,000-$500,000.** CD 10/9.

★†**N. Y., Sampson**—Yards & Docks, Navy Dpt., 18 St. and Constitution Ave. N.W., Wash., D. C., bldgs., imprvs., NOY 5587, to John A. Johnson Constr. Co., & Mt. Vernon Contg. Co., 268 41 St., Brooklyn, **$37,315,626.** Additional to CD 6/27 under CA.

†**New York**—U. S. Eng., 960 Ellicott Square Bldg., Buffalo, constructing, remodeling bldgs., Jefferson Co., to Deline Constr. Co., 729 Mill St., Watertown, **$100,000-$500,000.**

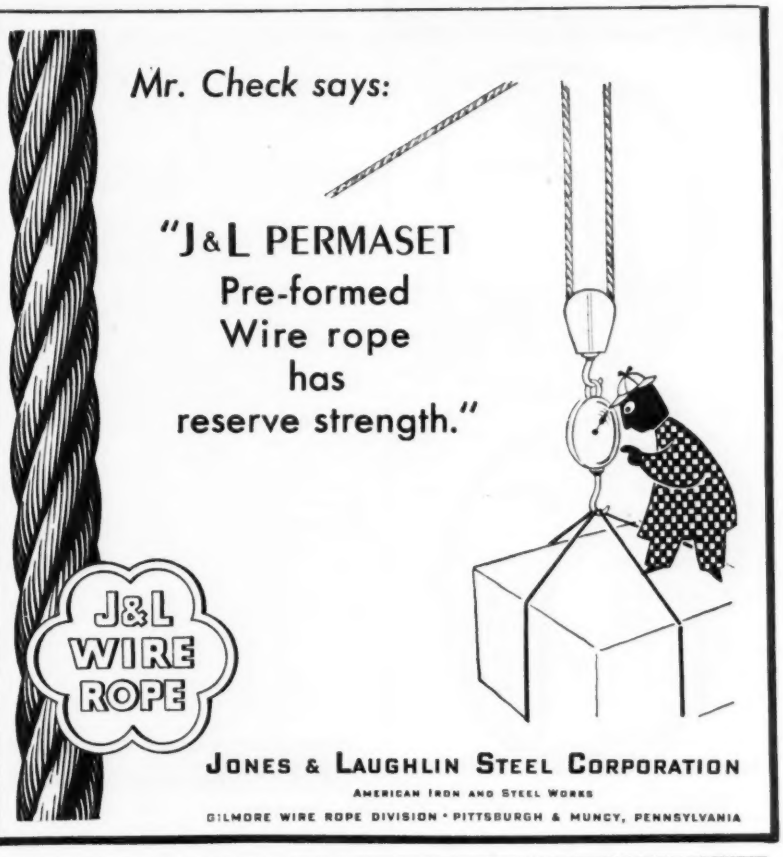
★†**North Carolina**—U. S. Eng., Fort Bragg, temporary frame bldgs., Cumberland Co., to F. D. Cline, Fort Bragg, **$100,000-$500,000.**

†**N. C., Wilmington**—Federal Works Agency, 606 State Planters Bldg., Richmond, Va., 3 story, brick, concrete addn. Community Hospital for Negroes and 2 story, brick, frame addn. nurses home, to Fowler-Jones Constr. Co., Winston-Salem **$216,879.**

★†**South Carolina**—Pub. Housing Auth., NHA, Georgia Savings Bank Bldg., Peachtree and Broad Sts., Atlanta, Ga., housing, to Green Lumber Co., Charleston***housing to H. C. Beck, Charleston, and c/o Central Contg. Co., 1st Natl. Bank Bldg., Atlanta, Ga. ***housing, to Skinner & Ruddock, 155 E. Bay St., Charleston, all Proj. SC38026.

†**South Carolina**—U. S. Eng., Camp Croft, bldg., Spartanburg Co., to Henry B. McKay Co., Greenville.

†**South Carolina**—U. S. Eng., Fort Jackson, bldg. addns., Lexington Co., to John C. Heslep Const. Co., Carolina Bank Bldg., Columbia.



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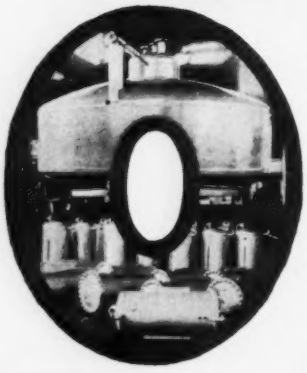

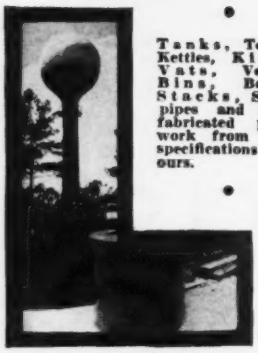

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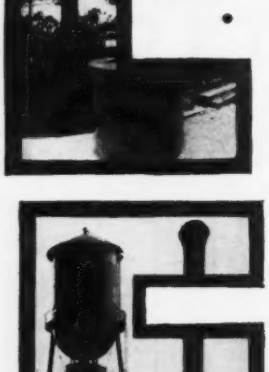

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PUBLIC BUILDING (Contracts Awarded, Cont'd.)

†**Tennessee**—Pub. Housing Auth., NHA, Georgia Savings Bank Bldg., Peachtree and Broad St., Atlanta, Ga., demountable housing, Tenn. 40023, to A. Blair, 1st Natl. Bank Bldg., Montgomery, Ala.

†**Texas**—U. S. Eng., 231 W. Main St., Denison, bldgs., Inv. 257-43-53, Tarrant Co., to B. B. Adams, 414 1st Natl. Bank Bldg., Fort Worth, **$100,000-$500,000.**

★†**Texas**—U. S. Eng., 231 W. Main St., Denison, addnl. construction, Wichita Co., to H. S. Moore, Ada, Okla., **$500,000-$1,000,000** ***motor repair shop and oil storage house, Wichita Co., to W. A. Zant & J. L. Green, Lawton, Okla., under **$50,000.** CD 10/13—ENR 10/15, under Unclassified.

†**Texas**—U. S. Eng., Fort Sam Houston, bldg., utilities, elec. distr. sys., etc., Spec. 42-435, Bexar Co., to Quisle & Andrews, 601 Builders Exch. Bldg., San Antonio, **$100,000-$500,000.** Former contract rescinded. CD 10/15—ENR 10/22 under CA.

★†**Texas**—Pub. Housing Auth., NHA, Electric Bldg., 7 and Taylor Sts., Fort Worth, houses, to Martin Investment Co., Union Natl. Bldg., Houston, approx. **$750,000.**

†**Virginia**—U. S. Eng., 415 P. O. and Court House Bldg., Norfolk, general contract bldgs., to James Fox & Sons, 2501 E. Franklin St., Richmond.

†**Washington**—U. S. Eng., 800 3 Ave., Seattle, bldgs., Spokane Co., to Hawkins & Armstrong, 5265 16 Ave. N.E., Seattle, **$100,000-$500,000.**

★†**Wisconsin**—Pub. Housing Auth., NHA, 201 N. Wells St., Chicago, Ill., temporary row houses, Wis. 47012, to Kroening Eng. Corp., 4500 W. Mitchell St., Milwaukee, **$593,800.** Bids 10/15. CD 10/20—ENR 10/22, under LB.

★†**Wis., Sturgeon Bay**—Pub. Housing Auth., NHA, 201 N. Wells St., Chicago, Ill., general contract incl. excav., grading, roads, paving, water distr. sys., sewers, overhead electrical distr. sys., lawns, planting, 500 prefabricated houses and administration bldg., etc., Wis.-47022, to Koening Eng. Corp., 4500 Mitchell St., Milwaukee, **$1,251,000.** CD 10/22—ENR 10/29 under LB.

COMMERCIAL BUILDINGS

PROPOSED WORK

★**California**—Geo. C. Goheen, Box 12, Mill Valley, two hundred sixteen 1 story frame residences, Richardson Island tract east of U.S. Hy. 101 between San Clemente and Greenbrae, etc. $864,000.

Mo., St. Louis—Peoples Hospital, H. S. Blackiston, pres., 3447 Pine St., purchasing, converting 3 story, bsmnt. bldg. into hospital, 2221 Locust Ave. $150,000. Applied for FWA funds.

★**N. J., Camden**—Green-Muth Corp., 444 Sunrise Hy., Rockville Center, N. Y., plans by G. Iser, 10 E 29 tS., New York, N. Y., two hundred fifty 1½ story, bsmnt., frame residences. $1,000,000.

N. J., Newark—Hanford Homes, Inc., 447 Chestnut St., Union, plans by G. Ripa, 230 Henry St., East Orange, fifty 2 story, bsmnt., asbestos shingle residences. $400,000.

CONTRACTS AWARDED

★**Calif., Long Beach**—Artcraft Builders, 6900 S. Western Ave., Los Angeles, 300 each triplex frame, stucco, apartment bldgs. Owner builds. Over **$500,000.**

Calif., Moraga—St. Marys College, Moraga, addnl. bldgs., Pre-Flight School, to Eaton & Smith, 715 Ocean Ave., San Francisco. L. H. Nishkian, 155 Sansome St., San Francisco, engr.

★**Calif., North Long Beach (Sta. Long Beach)**—Artcraft Builders, 6900 S. Western Ave., Los Angeles, 158 frame, stucco dwellings. Owner builds. Over **$500,000.**

★**Conn., Bristol**—Sylbern Homes of Connecticut, Inc., Brookfield Blvd., Valley Stream, N. Y., one hundred forty-five addnl. 1½ story houses. Owner builds. **$812,000.**

Miss., Greenwood—Greenwood Homes, Inc., F. R. McGeog, pres., 60 one story frame residences, to W. E. Johnson and Marx & Bensdorf, Greenwood, about **$200,000.** CD 9/30—ENR 10/8.

★**O., Cleveland**—Kenwood Homes, Inc., W. Bicknell, Jr., pres., 3868 Carnegie Ave., 324 unit housing, to Cleveland Constr. Co., 3868 Carnegie Ave. Est. **$2,500,000.** Garfield, Harris, Robinson & Schafer, National City Bldg., engrs. and archts.

Pa., Beaver Falls—Sunrise Gardens, Inc., A. Rudman, in charge, 924 Jones Law Bldg., Pittsburgh, forty 1 and 1½ story, brick, frame residences, College Hill Ave., separate contracts. **$220,000.**

R. I., Warwick—Old Colony Homes, Inc., 276 Park Ave., Cranston, 1½ story, 25x30 ft., frame houses, Brightside Plat, to Nazzareno Meloccaro, 85 Legion Way, Providence. Est. **$150,000.** H. Chappy, 276 Park Ave., Cranston, engr.

★**Utah, Sunnyside**—Utah Fuel Co. and H. J. Kaiser, c/o Utah Fuel Co., Judge Bldg.,

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UNCLASSIFIED (Contracts Awarded, Cont'd.) Salt Lake City, housing, to MacIsaac & Menke, 3440 E. 22 St., Los Angeles, Calif., and Pozzo Constr. Co., 2403 Riverside Dr., Los Angeles, Calif., approx. **$1,000,000.** CD 9/24—ENR 10/1 under CA.

INDUSTRIAL BUILDINGS

PROPOSED WORK

Ia., Cedar Rapids—STEAM GENERATING ★UNIT—Iowa Electric Light & Power Co., F. C. Chambers, genl. mgr., Security Bldg., steam generating unit $1,200,000; turbine addn. $700,000.

Mo., St. Louis — ABATTOIR — American Packing Co., 3842 Garfield Ave., plans by Henschien, Everds & Crombie, 59 E. Van Buren Ave., Chicago, Ill., remodeling abattoir, 3833 Cote Brilliante Ave.

Nev., Tonopah—MILL, etc.—Tonopah Extension Mining Co., Tonopah, rebuilding mill, 2 story Graystone Hotel, Mannington warehouse. $250,000.

New Jersey—PLANT—Industrial Company, 1 story, 80x184 ft. concrete block plant, Mercer Co. W. Slack & Son, 1401 State St., Trenton, archts. CD 10/19—ENR 10/29.

N. C., Kings Mountain—PLANT—Solvay Process Co., Milton Ave., Solvay, N. Y., mineral plant.

O., Cleveland—FACTORY—Cleveland Steel Barrel Co., J. M. Finney, pres., 9612 Meech Ave., 1 story, 60x132 ft. timber, brick factory addn. $40,000. H. M. Morse, 1500 E. Superior St., engr.

O., Cleveland — SUBSTATION — Cleveland Electric Illuminating Co., W. H. Hartman, purch. agt., 75 Pub. Sq., 1 story, 60x175 ft., brick, steel electric substation. $195,000.

Wisconsin—FACTORY—Industrial Company bids soon, 1 story, brick, steel rein.-con. factory superstructure. Approx. $100,000. Giffels & Vallet, 1000 Marquette Bldg., Detroit, Mich., engrs. and archts. CD 9/25—ENR 10/1 under CA.

BIDS ASKED

O., Cleveland — PLANT — Vanderhorst Co., Olean, N. Y., c/o D. Murdock, 12500 Berea Rd., converting bldg. into mfg. plant. $100,000.

CONTRACTS AWARDED

Calif., Oakland — SHOP — Western Pacific R.R. Co., T. L. Phillips, ch. engr., 526 Mission St., San Francisco, electric shop, to H. J. Christenson Co. & W. E. Lyons Constr. Co., 2489 Pacific Ave., Alameda.

Conn., Hartford—COAL HANDLING—Hartford Electric Light Co., 266 Pearl St., Hartford, coal handling bldg., conveyors, South Meadow Station, to Stone & Webster Eng. Corp., 49 Federal St., Boston, Mass., **$264,700.**

Conn., Stamford — FACTORY—Norma-Hoffman Bearings Corp., Hamilton Ave., 1 story, 125x135 ft., brick factory addn., to Vuono Constr. Co., 217 Bedford St. Est. **$55,000.** CD 8/27—ENR 9/3.

Conn., Seymour—FACTORY—Seymour Mfg. Co., 15 Franklin St., 1 story, 60x165 ft. brick factory, Franklin St., to Smith Constr. Co., Inc., 101 Water St., Derby. Est. **$40,000.** Bids 10/1. CD 9/29—ENR 10/1.

Ind., Dresser—GENERATOR STATION—Pub. Service Co. of Indiana, Inc., Traction Terminal Bldg., Indianapolis, superstructure 1 story, brick, concrete generator station, to J. L. Simmons Co., 715 Union Title Bldg., Indianapolis. Est. **$150,000.** Awarded 10/24. CD 8/27—ENR 9/3.

★**Ind., Edwardsport**—POWER PLANT—Pub. Service Co. of Indiana, Inc., Traction Terminal Bldg., Indianapolis, 1 story, bsmnt., brick, concrete power plant addn., to J. L. Simmons, 715 Union Title Bldg., Indianapolis, Est. **$500,000.** Sargent & Lundy, 140 S. Dearborn St., Chicago, Ill., engrs. Awarded 10/27.

La., Monroe—SHOPS, etc.—O. K. Rubber Welders Co., Monroe, shops, factories, steel frame, to R. M. Harmon, 308 Columbia Ave., **$40,000.** Awarded 10/19.

La., Monroe—WAREHOUSE—M. L. Causey, Monroe, steel, brick, concrete warehouse, to R. M. Harmon, 308 Columbia Ave., **$40,000.** Awarded 10/20.

Mass., Worcester—FACTORY—Wyman & Gordon Co., 105 Madison St., 1 story, 75x420 ft., brick, steel, concrete mfg. unit, Sherman St., to E. J. Cross Co., 140 Madison St., **$125,000**; electrical contract to Scrimgeour Electric Co., 41 Central St.

N. J., East Rutherford—FACTORY—E. C. Chapin Co., 253 Hackensack St., 3 story, bsmnt., brick, concrete block factory, to F. & C. Haerter, 6507 Dewey Ave., West New York, **$55,000.** Huesman & Osborne, 13 Orient Way, Rutherford, archt.

N. J., Jersey City—PLANT—National Bearing Metals Corp., 364 9 St., 2 story, brick, concrete factory addn., to Brown & Matthews, Inc., 122 E 42 St., New York, N. Y., **$50,000.** CD 3/16—ENR 3/19.

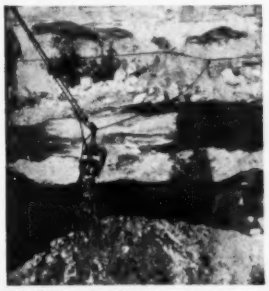
★**Ohio**—PLANT—Industrial Company, plant, to H. K. Ferguson, Hanna Bldg., Cleveland. Est. **$750,000.**

Wis., Madison—FACTORY—Scanlan-Morris Co., 1902 E. Johnson St., factory addn., to Walter Butler Co., Inc., 1030 Minnesota Bldg., St. Paul, Minn. Est. **$70,000.**

Scrapers and Cableways

. . . for All Kinds of Long Haul Work

Sauerman Drag Scraper handles huge stockpiles of crushed stone on concrete dam project.



Slackline Cableway cleans out a tailrace, moving tons of rock from stream to spoil pile.

SAUERMAN Slackline Cableways and Drag Scrapers offer the most satisfactory solutions for material-handling problems requiring machinery that will dig, convey and automatically dump.

These machines will dig any material that a plough can penetrate. One man controls the entire operation. Power cost and maintenance are exceedingly low per cubic yard of material handled.

A Sauerman machine digs with equal facility under water, on mushy ground, on a hillside or in a rough pit. Operation is continuous—digging, hauling and dumping. Capacities run from 10 to 600 cu. yd. per hour, varying in accordance with size of bucket and length of haul.

Thirty years of successful service have established the superiority of Sauerman machines for a great variety of long range material-handling jobs.

WRITE FOR CATALOG

SAUERMAN BROS., INC.
532 S. Clinton St., Chicago

TWO SHOTS OF A KIND
Aimed at the Same Foe!

GRACO CONVOY LUBER

Fast, accurate, high-powered weapons are vital necessities in winning this many-front war. GRACO Convoy Lubers are serving the field lubrication needs of our armed forces. Large war project contractors are using them all over the world, to speed up their on-the-job lubrication and at the same time protect their invaluable equipment against early wear-out.

Heavy duty pumps, dispense chassis, track, and gear lubricants at high speed through 30 foot hoses. Large irreplaceable tires are also quickly serviced through a convenient air line. Field servicing of construction machinery can be speeded up, with less men.

A letter or wire will bring a GRACO factory representative or a nearby distributor. Ask for bulletin #122.

GRACO

GRAY COMPANY, INC.
MINNEAPOLIS • MINNESOTA

SEARCHLIGHT SECTION

EMPLOYMENT • BUSINESS • OPPORTUNITIES • EQUIPMENT—USED or RESALE

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10 cents a word, minimum charge $2.00.

POSITIONS WANTED (full or part-time salaried employment only). ½ the above rates, payable in advance. (See ¶ on box Numbers.)

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BOX NUMBERS in care of any of our New York, Chicago or San Francisco offices count 10 words additional in undisplayed ads.

DISCOUNT of 10% if one payment is made in advance for four consecutive insertions of undisplayed ads (not including proposals).

DISPLAYED—RATE PER INCH:

The advertising rate is 6.90 per inch for all advertising appearing on other than a contract basis. Contract rates quoted on request.

AN ADVERTISING INCH is measured ⅞ inch vertically on one column, 3 columns—30 inches—to a page. E.N.R.

NEW ADVERTISEMENTS received by November 13th appear in November 19th issue subject to limitations of space available

WANTED
Refinery Design Engineer

Regular position for man with thorough knowledge of pressure vessel and piping design. Experience as chief draftsman and construction engineer is desirable. Location middle west. Medium size independent oil company. In reply please specify personal data, experience, draft status and salary required.

P-109, Engineering News-Record
520 No. Michigan Ave., Chicago, Ill.

POSITIONS VACANT

These Positions Vacant advertisements are published subject to agreement by the advertisers not to consider applicants now employed on war work unless they obtain written release from present employer.

WANTED—Graduate Civil Engineers—preferably with from two to five years general experience—as field engineers in connection with Water Waste Surveys, Distribution Studies and Trunk Main Surveys of Municipal Water Distribution Systems. The Pitometer Company, Inc., 250 Church Street, New York City, N. Y.

WANTED: Estimator and project manager for building contractor specializing in Federal work up to about $150,000 in size. Must know today's cost thoroughly. State experience and salary expected. P-148, Engineering News-Record, 330 W. 42nd St., New York, N. Y.

EMPLOYMENT SERVICE

EXECUTIVES AND TECHNICAL MEN. Qualified candidates desiring $2,000 to $20,000 positions may contact employers through our confidential services. Established 27 years. The National Business Bourse, 20 W. Jackson Blvd., Chicago.

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ENGINEERS. Fine selection of positions open for Manufacturing executives, Production Managers, Superintendents, Foremen, Metallurgists, Chemists, Instrument men, Technical men of all types. The Engineering Agency, Inc., our 50th year. 53 W. Jackson Blvd., Chicago.

POSITIONS WANTED

STRUCTURAL ENGINEER. Graduate C.E. Licensed N. Y., N. J., Pa., and Conn. 28 years designing and supervising all types of structures; concrete, steel, and timber. For past 18 years in charge of own organization as Consulting Engineer. Designed and supervised more than 50 million dollars worth of construction. Age 49. Perfect health. Fully qualified to take charge of project or drafting room. At present employed as Chief Engineer on large defense job. Will be available by November 7th. Desire position as Chief Engineer or project manager. PW-135, Engineering News-Record, 330 W. 42nd St., New York, N. Y.

ESTIMATOR and cost analyst engineer. General building construction. Experience in office and field, purchasing and functions of general contractors office. Draft exempt. PW-122, Engineering News-Record, 330 W. 42nd St., New York, N. Y.

GENERAL BUILDING Construction Superintendent or manager experience covers 30 years on all kinds of structures. Projects costing up to 10 Million Dollars. Also defense Housing cantonments, and industrial structures. PW-114, Engineering News-Record, 330 W. 42nd St., New York, N. Y.

CIVIL ENGINEER; Graduate; 33 years experience; design, construction; Industrial plants; Water supply; Hydro-electric developments. PW-36, Engineering News-Record, 330 W. 42nd St., New York, N. Y.

DIFFICULT FOUNDATIONS
HEAVY CONSTRUCTION

Experienced New York City Contractor available for sub-contracts or supervision. Specialists in pile driving, caisson work and reinforced concrete construction.

PW-154, Engineering News-Record
330 West 42nd St., New York City

POSITIONS WANTED

GENERAL CONTRACTORS SUPERINTENDENT. Age 43. Graduate Civil Engineer. Completing large defense airport, grading, drainage and paving. Available about December first; also several assistant superintendents and engineers. Prefer middle west or south. PW-115, Engineering News-Record, 520 N. Michigan Ave., Chicago, Ill.

STRUCTURAL DESIGN ENGINEER. Graduate C.E. Age 40. 18 years experience design and detail in steel, concrete or timber structures. Shipways, Piers, Docks, Quay and Retaining Walls, Heavy Foundations, Industrial and Commercial Buildings, Hotels and Office Buildings. Capable of taking charge of all design work, as well as the execution of all structural plans and specifications for a complete project. Available November 1st. PW-128, Engineering News-Record, 330 W. 42nd St., New York, N. Y.

LICENSED CIVIL STRUCTURAL ENGINEER, Graduate Colorado University, fourteen years general experience detailing and designing structural steel and concrete for bridges and buildings; fourteen years estimating and supervising building construction. Desires position as estimator superintendent or designer. Report on short notice. AMD, 1223 N. Lowry Ave., Springfield, Ohio.

GRADUATE CIVIL ENGINEER—With seven years practical engineering experience; drafting, railroads, roads, subways, large scale location surveys, modern methods of rigid frame analysis, some actual structural design, inspection, expert soil analyst. First hand experience in the design of concrete and asphaltic concrete mixes. Now available, age 32, draft status 3-A. Write or wire to P. O. Box 232, Texarkana, U. S. A.

CONSTRUCTION SUPERINTENDENT, Twenty years experience, supervising general building construction operations, familiar and capable with all types of general construction. Seeks contact with those in need of a well seasoned hustler, location immaterial. PW-151, Engineering News-Record, 330 W. 42nd St., New York, N. Y.

ENGINEER — Industrial Plant Design — C. E. graduate plus M. E. background, N. Y. State License. 13 years mechanical, structural, and machine design experience. Know theory, can supervise and coordinate work of draftsmen. Quickly adaptable to new projects and methods. Resume on request. PW-156, Engineering News-Record, 330 W. 42nd St., New York, N. Y.

SALARIED POSITIONS $2,500 to $25,000

This advertising service of 32 years' recognized standing negotiates for positions of calibre indicated. Procedure individualized to your personal requirements. Retaining fee protected by refund provision. Identity covered. If salary has been $2,500. or more send for details.

R. W. BIXBY, INC.
272 Delward Bldg., Buffalo, N. Y.

POSITIONS WANTED

CIVIL ENGINEER—registered—20 years experience surveys sewers, roads, buildings, construction and design. Full supervision (one year) of airport layout and drainage, etc. Available at once—location East. PW-157, Engineering News-Record, 330 W. 42nd St., New York, N. Y.

CONSTRUCTION SUPERINTENDENT and Engineer: Age 33, Sewers, water, domestic gas, process piping, welded pipe-lines, roads, disposal, contonment buildings. Can Supervise, Estimate, Design; competent with contracts and writing of Specifications. PW-58, Engineering News-Record, 330 W. 42nd St., New York, N. Y.

WORK WANTED

SUBCONTRACTOR—Experienced Government frame construction. Complete organization and equipment. Go anywhere. WW-127, Engineering News-Record, 330 W. 42nd St., New York, N. Y.

SURVEY PARTY. Complete equipment and transportation. Available in two weeks. WW-147, Engineering News-Record, 330 W. 42nd St., New York, N. Y.

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PATENTS, TRADE-MARKS, Booklet, "General Information Concerning Inventions and Patents' and "Free Schedule" sent without obligation. Established 1915. Lancaster, Allwine & Rommel, Suite 454, 815 10th St., N. W., Washington, D. C.

BUSINESS OPPORTUNITIES

Capital Available

SUPERINTENDENT OF CONSTRUCTION, Organization and capital available. Construction superintendent, highly qualified, and with long record contracting experience, now completing large base in Pacific Northwest including concrete runways, hangars, bridges, docks, sea-plane ramp, buildings, roads, tanks, pipelines, huts, utilities, etc. at record low prices, has self and large organization available for any large construction project. Can supply ample capital for attractive set-up. Able executive and have done work throughout U. S. Write BO-149, Engineering News-Record 68 Post Street, San Francisco, Cal.

(Continued on the opposite page)

A COURSE OF INSTRUCTION BY MAIL IN

STRUCTURAL ENGINEERING

Thirtieth Year

(In the following list, Courses A, B, and C are abbreviated from our complete Structural Engineering course).
A—Public Works Structures.
B—Architectural Engineering.
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Our Courses are offered principally to
ADULT CIVIL ENGINEERS AND ARCHITECTS

Ninety percent of our engineering students are former graduates (C.E.) from engineering colleges. Our courses have helped thousands of engineers to better positions, increased pay, and success "after forty".

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